

EXECUTIVE SUMMARY

French National Railways (hereinafter SNCF) propose to develop, implement and operate new high speed rail services in the Federal Railroad Administration designated California High Speed Rail Corridor. Our expression of interest and qualifications is in response the FRA's Request for Expressions of Interest dated December 11, 2008.

Implementing High Speed Rail in California through SNCF's HST 220 concept represents a new mode of transportation with a wide range of benefits that meet environmental and sustainable development objectives. In preparing this Expression of Interest, SNCF has addressed whether its High Speed Rail proposal, which is based on successful and self-supporting services in France and around the world, can provide a valuable choice for travelers in California, be operated without government subsidy or even cover a portion of construction costs through operations revenues, and fulfill these important environmental goals.

Proposed HST 220 concept

An attractive, convenient and modally competitive high speed rail service linking the major population centers of San Francisco to Los Angeles and Anaheim is proposed, consistent with the concept advanced by the California High Speed Rail Authority (CHSRA). Speeds of up to 220 mph are expected to generate a significant number of new trips as well as draw from the air and auto modes. Access to HSR Services for both residents and visitors will be enabled via 16 proposed stations conveniently located close to medium and large city populations, city central business districts and airports to attract residents, providing convenient and cost competitive alternative to driving and air travel.

To reduce both land use and environmental impacts and to ease the process of right-of-way acquisition, the HSR route is to be located along or next to existing transportation infrastructure. To this end allowances have been made for acquisition of the needed right-of-way for dedicated HSR operations. Rolling stock capable of speeds up to 220 mph will be provided. Seating, with capacity for 500 to 550 passengers per 200m-long train unit, comfort and on-board amenities will be consistent with the highest quality standards in place today, using Europe's Technical Specifications for Interoperability (TSI), modified as needed to conform to all Federal Railroad Administration requirements. Using TSI as a basis offers a service with proven performance in terms of safety, travel times, operations reliability, and efficiencies in service commissioning and start-up as well as long term inspection and maintenance.

Examples of approximate trip times between major city pairs are San Francisco to Los Angeles – 2 hour 40 minutes, Fresno to Los Angeles – 1 hour 26 minutes, and Merced to San Francisco – 1 hour 35 minutes.

Ridership estimates based on a full complement of services after an initial ramp-up period are 8.5 million trips in the San Francisco to Fresno market (in the year 2020) which would be operated in a first phase, and 55 million trips between San Francisco and Anaheim with the full build out in the year 2030.

Many national and State-level goals will be achieved. HSR is among the most energy efficient modes of transportation. Greenhouse gas and other vehicle emissions will be reduced. Preliminary estimates show that HSR will generate 24% of the emissions compared to the same trips made by car or by air. At the same time, currently forecasted roadway and airport congestion will be mitigated, making the implementation of HSR accrue benefits to

those modes. Also, these trips will be safer. Up to 4,600 fatalities and 352,000 injuries will be avoided between the years 2020 and 2050.

Stations will catalyze the redevelopment of host communities. Opportunities for economic development, in terms of over 154,000 new jobs in construction and over 300,000 new jobs in operations and maintenance, will draw workers from all socio-economic segments.

The length of the alignment, combined with the populations of the cities served as well as the limited airport and roadway capacity along the corridor, are strong indicators of a successful high speed rail service. Operations planning will be optimized in several ways to cater to the residential, business and visitor market segments, in ways to increase ridership and revenue. The provision of a wide array of amenities and class/price options, along with reliable, on time service, will create market attractiveness and confidence.

A phased approach is proposed, starting with the San Francisco to Fresno/Merced segment, and the extension to Los Angeles and Anaheim. As part of the first phase, proposed to start service in 2018, certain aspects of the High Speed Rail program will be newly introduced to the United States in California (and perhaps in other corridors as well) in the areas of operations, safety and the mixing of services in certain areas such as approaches to existing stations. We will work with FRA and other agencies of jurisdiction in the transition to these new technologies. The full build out is estimated to open in 2024.

Project management approach

The success of implementing High Speed Rail in the California Corridor rests upon the integrated design, operations, financing, and environmental assessment disciplines experienced in high speed rail projects. This is proven through SNCF participation in many successful projects in many parts of the world. In the United States, governmental agency involvement is important for structuring the required up-front capital investment, and to partner in the environmental clearance providing mitigation in particular against earthquakes, and approval processes. While the particular form of the most suitable organization is subject to detailed technical, financial and legal studies, it is conceived that a Special Purpose Company would operate the HSR service and finance a part of the initial capital costs.

The business case

Capital costs have been roughly estimated at USD 37.6 billion in 2009 dollars. Included within this amount are USD 10.1 billion for rolling stock and USD 1.9 billion for right-of-way and acquisition. The remainder is in guideway and civil construction (USD 19.9 billion), systems and maintenance facilities (USD 4.5 billion) and stations (USD 1.2 billion). Estimates of revenue, annual operating and maintenance costs are that as ridership matures and service is fully established, revenue will exceed O&M costs and will also cover a portion of the capital costs to the extent that public funding will be required for only 70% of the initial capital investment.

In present value discounted at 4%, the benefits of the HST 220 concept would represent in USD 2009 290% of the public funds required, and would cover public funding in less than ten years.

TABLE OF CONTENTS

1	POINT OF CONTACT	7
2	NAME(S) AND QUALIFICATIONS OF THE PERSON(S) SUBMITTING THE EXPRESSION OF INTEREST	8
3	PROJECT OVERVIEW	9
3.A	BACKGROUND, OBJECTIVES AND PHILOSOPHY BEHIND THE SNCF RESPONSE ...	9
3.a.1	Background.....	9
3.a.2	The FRA-Designated Corridors and SNCF	10
3.a.3	The philosophy behind the SNCF response	10
3.a.4	Economic requirements.....	10
3.a.5	Technical requirements	11
3.a.6	Operations	11
3.B	THE CHALLENGES.....	12
3.b.1	Strategy development.....	12
3.b.2	Operations	12
3.b.3	Financial.....	12
3.b.4	Benefits	13
3.C	THE ROUTE	13
3.D	BUILDING AN OPERATING PLAN.....	14
3.d.1	Train operation scheduling, stopping patterns.....	14
3.d.2	Marketing	15
3.E	ENVIRONMENTAL APPROACH FOR HIGH SPEED LINES.....	15
3.F	CAPITAL NEEDS ASSESSMENTS	16
3.G	OPERATING AND FINANCIAL RESULTS	17
3.H	THE BENEFITS	17
3.I	PROGRAM IMPLEMENTATION	20
3.i.1	Service implementation plan schedule	20
3.i.2	Delivering the project	20
3.i.3	Risk management.....	21
4	DETAILED TECHNICAL DESCRIPTION OF THE PROJECT	22
4.A	POPULATIONS OF MARKETS SERVED BY EACH OF THE PROPOSED STATIONS....	22
4.A.1	Population Forecasts	22
4.A.2	Economic analysis.....	23
4.B	EXISTING INTERCITY TRAFFIC BY MODE.....	23
4.C	PROPOSED HSR STATION LOCATIONS.....	24
4.c.1	Station locations.....	24
4.c.2	Station buildings.....	25
4.D	INTERMODAL TRAVEL CONNECTIONS WITH OTHER TRANSPORTATION SERVICES	27
4.d.1	The station as an intermodal hub.....	28
4.d.2	Connecting HSR to the existing rail network and local transportation modes	28
4.d.3	Auto access and parking lots.....	28
4.d.4	Catering to "soft", non-motorized transport modes and new mobility concepts	29
4.d.5	HSR and air travelers.....	29
4.d.6	Impact of multimodality on distribution and operations	29

4.E	TRIP TIME AND FARE COMPARISONS.....	30
4.e.1	Trip times	30
4.e.2	Station services.....	31
4.e.3	On board services	31
4.e.4	Fares.....	32
4.e.5	Comparisons with other services	32
4.e.6	Door-to-door travel times - examples	32
4.e.7	Travel costs	33
4.e.8	Door-to Door costs examples	34
4.F	OPERATING PLAN	35
4.f.1	Train operation scheduling.....	35
4.f.2	Train capacity and service frequency.....	35
4.f.3	Stopping patterns.....	35
4.f.4	Station capacity and maintenance depots location.....	35
4.f.5	Train service	35
4.f.6	Operations management.....	36
4.f.7	Intermodal Connections.....	37
4.G	ANNUAL RIDERSHIP AND REVENUE PROJECTIONS.....	37
4.g.1	The California High-Speed Rail Authority ridership modeling process	37
4.g.2	Revenue analysis	39
4.H	OPERATING COSTS.....	40
4.h.1	Operating cost estimates.....	40
4.h.2	Infrastructure and Rolling Stock maintenance costs.....	40
4.h.3	Productivity factor and final results	40
4.I	IMPACT OF THE PROJECT - PUBLIC BENEFITS	41
4.i.1	Major benefits of the high speed rail system to the public and the transportation system	41
4.i.2	Methodology	42
4.i.3	Benefits to cost analysis	43
4.i.4	Other benefits	46
4.J	IMPACT OF THE PROJECT ON GROWTH OF EXISTING SERVICES	46
4.K	IMPACT OF THE PROJECT ON OTHER RAIL SERVICES	47
4.k.1	Services.....	47
4.k.2	Other passenger operators	48
4.k.3	Railway Infrastructure	48
4.L	PROPOSED ROUTES AND ALIGNMENTS.....	49
4.l.1	Existing Right Of Way (ROW)	50
4.l.2	New Right of Way.....	50
4.M	REQUIRED INFRASTRUCTURE INVESTMENTS AND IMPROVEMENTS	50
4.N	MITIGATION OF ADVERSE IMPACTS	51
4.O	TYPE AND QUANTITY OF TRAIN EQUIPMENT.....	52
4.o.1	Maximum speed.....	53
4.o.2	Passenger amenities - service on board	53
4.o.3	Energy consumption profile	53
4.o.4	Acceleration and deceleration rates	53
4.o.5	Service development plan, fleet and phasing	53
4.P	PROJECT CAPITAL COSTS.....	54
4.p.1	Major categories of expenditure.....	54
4.p.2	Methodology and assumptions.....	54

4.p.3	Rolling Stock costs	56
4.p.4	Capital costs summary	56
4.Q	DETAILED ANALYSIS OF THE METHODS AND TECHNOLOGIES ACCORDING TO TRIP TIMES AND RELIABILITY STANDARDS	57
4.R	SYNOPSIS AND REFERENCES FOR ANY PAST HSR RELEVANT STUDIES.....	58
5	FINANCIAL PLAN	59
5.A	PROJECTED ANNUAL OPERATING FAREBOX REVENUES	59
5.B	ESTIMATED ANNUAL OPERATING COSTS BY TYPE OF EXPENDITURE.....	59
5.C	ANNUAL SCHEDULE OF CAPITAL COSTS.....	59
5.D	SOURCES AND DESCRIPTIONS OF CAPITAL FUNDS	60
5.E	CREDIT ASSUMPTIONS	60
5.F	INSURANCE PROGRAM FOR CONSTRUCTION AND OPERATION	61
5.G	CONSTRUCTION COST RISK SHARING AND RATIONALE FOR THE PROPOSED APPROACH	61
5.H	REVENUE AND OPERATING COST RISK SHARING AND RATIONALE FOR THE PROPOSED APPROACH.....	62
5.I	PROJECTED FUNDING FOR THE FULL FAIR MARKET COMPENSATION FOR ANY ASSET	62
5.J	PROJECTED FINANCIAL STATEMENT	62
5.j.1	Financial analysis methodology and project modeling	62
5.j.2	Overall financials of the project	63
5.j.3	SNCF Financial Approach.....	63
6	INSTITUTIONAL FRAMEWORK AND OTHER INSTITUTIONAL ISSUES	67
6.A	PROJECT STRUCTURE ORGANIZATION CHART - RELATIONSHIPS AMONG THE ENTITIES	67
6.a.1	Project structure organization chart.....	67
6.a.2	Relationships between the parties involved	67
6.B	NEW ENTITIES REQUIRED AND HOW THEY WILL BE STRUCTURED LEGALLY AND FINANCIALLY	68
6.C	INTEGRATION OF THE PROPOSED SERVICE WITH OTHER SERVICES AND SYSTEMS	68
6.D	FEASIBILITY OF GAINING ACCESS TO REQUIRED ROW	68
6.E	REQUIRED GOVERNMENTAL ACTIONS AND APPROVALS AND ROLE OF THE STATE GOVERNMENT(S)	69
6.e.1	Required Government actions & approvals	69
6.e.2	Role of State Governments in Implementing Proposal	70
6.F	RELATIONSHIP TO STATE RAIL PLANS AND PROGRAMS	70
7	LEGISLATIVE ACTIONS	72
7.A	FEDERAL, STATE AND/OR LOCAL LEGISLATION.....	72
7.a.1	Authorize and create a sponsoring entity for the project.....	72
7.a.2	Remove legal impediments to project implementation.....	72
7.a.3	Otherwise facilitate project	74
7.B	PUBLIC FUNDING COMMITMENTS, FEDERAL, STATE AND/OR LOCAL	74
7.C	LEGISLATIVE ACTIONS / GOVERNMENT-SPONSORED PROGRAMS	75
8	COMPLIANCE WITH FEDERAL, STATE AND LOCAL LAWS.....	76
8.A	RIGHTS AND STATUS OF EMPLOYEES	76
8.B	RAIL SAFETY AND SECURITY LAWS, ORDERS AND REGULATIONS	76
8.C	ENVIRONMENTAL LAWS AND REGULATIONS	77

8.c.1	Compliance with environmental laws and regulations.....	77
8.c.2	Compliance with Federal, state and local requirements	78
8.D	THE AMERICANS WITH DISABILITIES ACT	78
9	OPTIONAL CONTENTS	80
9.A	CONTRACTING STRUCTURE TO PROVIDE THE MOST EFFECTIVE ALLOCATION OF THE RISK BETWEEN PRIVATE AND PUBLIC SECTORS.....	80
9.B	PRIVATE SECTOR INVOLVEMENT - PROCUREMENT STRATEGY.....	80
9.C	PROJECT FINANCING STRUCTURE	80
9.D	ROLE OF PUBLIC SECTOR COMMITMENTS IN FINANCING THE PROJECT	81
9.E	MEASURES OR COMMITMENTS TO PROVIDE AND FACILITATE MULTI-YEAR FEDERAL COMMITMENTS	81
9.F	ROLE OF PRIVATE EQUITY IN FINANCING THE PROJECT	82
9.G	KEY CONSIDERATIONS TO ENCOURAGE OR DISSUADE PRIVATE SECTOR INVOLVEMENT.....	82
9.H	STRUCTURES AND MODELS TO GUIDE THE COMMISSIONS.....	82
9.I	CONTRIBUTION TO THE DEVELOPMENT OF A NATIONAL HSR SYSTEM.....	83

1 POINT OF CONTACT

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2 NAME(S) AND QUALIFICATIONS OF THE PERSON(S) SUBMITTING THE EXPRESSION OF INTEREST

For the purpose of this RFEI, SNCF has set up a team of experienced professionals in order to address each field of the request. Appendix 1 gives the profile of each of the team members covering different areas: Project Director (Jean-Pierre Orsi), project management (Karine Meyer), business development & commercial (Scheherazade Zekri-Chevallet, Guillaume Genin and Pierre Tilhou), operating plan (Jean-Marc Galimont), infrastructure (Dominique Rulens), rolling stock and maintenance (Gérard Pitault), stations (Andreas Heym and Mikaël Lannoy), marketing (Pierre Tilhou), traffic and economic analysis (Olivier Picq and Jean-Pierre Arduin), financial analysis (Ludovic Guitton, Laurent Thorrance and Pauline Pezerat), environment (Benoît Aliadière, Aurélia Gravet and Sophie Galichon), and legal advisors.

In addition, the team was supported by an industry-wide internationally-recognized advisor (Jean-Marie Metzler). A steering committee supervised the material produced by the team (Frank Bernard, Pascal Lupo and Dominique Thillaud).

The lead entity is SNCF (French National Railway), a company registered in France under number 552 049 447, while most of the SNCF Divisions and some of its affiliates were involved in the project (operations, maintenance, engineering, infrastructure, rolling stock, stations & connectivity, and finance). At this stage, SNCF has elected to answer the RFEI on its own and has not yet formed any consortia or structures, even though these aspects have already been given due consideration.

3 PROJECT OVERVIEW

3.a BACKGROUND, OBJECTIVES AND PHILOSOPHY BEHIND THE SNCF RESPONSE

3.a.1 Background

SNCF¹, a world leader in the field of high-speed rail (HSR), hereby expresses its interest in participating in the development of new high-speed rail services in the FRA-designated (B) California Corridor. Our skills and capabilities are based on our experience running the French National Railway, including: i) operating 800 daily services with a fleet of 460 high-speed trains at speeds of up to 200 mph; ii) maintaining 5,000 miles of railroad track, including 1,500 miles of dedicated HSR lines; and iii) safely covering an average of 280,000 passenger miles and carrying 120 million passengers per year without a single fatal accident since the commissioning of the first high-speed line in 1981. This unique experience covers all the specialized areas concerned, from project engineering (including the environmental impact and funding aspects) to project management, design, construction, commissioning, operations, and marketing of services.

The gradual build-up of HSR services in France over the past 25 years has enabled: i) traffic forecast and modal split models (road/air/rail) to be finely adjusted to the different target markets, ii) the techniques for producing socio-economic and financial balance sheets to be fine-tuned for greater accuracy, iii) unique and invaluable experience to be acquired in perfecting a system of consultations with all the players directly or indirectly involved, especially over environmental, energy consumption and greenhouse gas-related issues, and iv) finally, in the interests of the community at large, the emergence of well-coordinated development policies combining high-speed, regional and urban rail services to create a network of stations, each one a dynamic focal hub in its region, and where appropriate, fully interfaced with air transportation services.

Outside France, SNCF has taken an active role in operating high-speed railroads internationally and sharing its institutional knowledge with foreign HSR entities. For instance, SNCF has a majority stake in Eurostar, the company that operates high-speed services between London and mainland Europe, and is also the main partner of the new private Italian HST operator, NTV. SNCF has also been actively engaged in HSR development projects in United Kingdom, South Korea, Taiwan, Spain, Morocco, and Saudi Arabia – just to name a few.

The financial success of SNCF's first high-speed line - between Paris and Lyons - prompted the Company to invest significant funds in later HSR infrastructure projects. The Paris-Lyons line was financed by SNCF itself, an investment recouped in just seven years, and the scale of the benefits to the community at large – modal shift, safety, land use planning, environment – marked the massive success of that project.

Similar Public Private Partnerships (P3) are now a common way of creating the robust financial packages necessary to secure the funds needed for new HSR projects. SNCF has developed considerable experience in using P3-approaches and it is prepared to consider any financing mechanism that can help ensure the viability of a HSR project.

¹ In this document, the term "SNCF" refers to SNCF and the SNCF Group as a whole.

3.a.2 The FRA-Designated Corridors and SNCF

SNCF is ready to apply its experience with regard to HSR-Express services, to the ambitious plans recently announced by the Federal Railroad Administration.

SNCF has had a significant presence in the United States and has enjoyed strong working relationships with U.S. companies for over 75 years. Rail Europe Inc., a division of SNCF that has maintained a U.S. office since the 1930's, sells tickets to over 1 million American tourists visiting Europe each year. As recently as the 1990's, SNCF partnered with American Airlines' Sabre Division in developing a global rail distribution system. Through the years, various branches of SNCF have worked with federal, state and local authorities to contribute to different transportation projects, including HSR planning studies.

We believe the United States is ideally suited for HSR: it features large metropolitan areas that are relatively far apart, a highly mobile population (2.5 times the European average), and a fast-growing awareness of the importance of the environmental challenges HSR can address. The California Corridor will be one of the first developed for HSR-Express service, and should lay the groundwork for similar projects throughout the United States.

3.a.3 The philosophy behind the SNCF response

SNCF's RFEI submission takes account of the expectations of the FRA and Congress as expressed in the Passenger Rail Investment and Improvement Act (PRIIA), the American Recovery and Reinvestment Act (ARRA), the Obama Administration's "Vision for High-Speed Rail in America," and the High-Speed Intercity Passenger Rail (HSIPR) Program Interim Program Guidance released in June 2009.

SNCF is prepared for FRA and its associated stakeholders to utilize SNCF's engineering, operation and infrastructure/rolling stock maintenance expertise. SNCF is ready to mobilize its experts in these and various other related fields. Should SNCF be asked to pursue the examination of its further involvement, the Company would quickly establish contacts with other stakeholders (right-of-way owners, other transport operators, etc.), and with potential technical and financial partners, in order form suitable consortiums to address the project's challenges.

All economic, demographic and ridership data presently available has been used to update the ridership forecasts carried out in connection with completed project design phases. In addition, whenever deemed appropriate or when previous studies were judged too old, specific research has been conducted to refresh and benchmark new ridership forecasts, using for instance, gravity models calibrated to U.S. data. The proven reliability of such completely auditable methods is one of the guarantees of the success of projects thus designed. Particular attention has also been paid to examining interfaces with air transportation.

3.a.4 Economic requirements

SNCF's project finance philosophy is that, to be viable, any high-speed rail service project must meet each of the following criteria:

- Operating and maintenance costs must be covered by the revenues from ridership: there should be no operating subsidies
- The socio-economic benefits must offset the public investments.

Against this backdrop, there are numerous ways to develop a HSR project, depending, for instance, on i) the level of the operating result (earnings before interest, taxes, depreciation and amortization, or EBITDA), ii) the distribution of capital costs between stakeholders, iii) the allocation of risk, etc.

In this response, SNCF has set out to ascertain if these two criteria can be met, and express its interest in undertaking further studies and making contact with stakeholders for purposes of producing a comprehensive proposal, if selected to do so.

3.a.5 Technical requirements

The engineering specifications will have to meet both U.S. requirements and the performance standards set by SNCF. SNCF is prepared to cooperate closely with the FRA in sharing its know-how and experience in order to guarantee safety standards at least equivalent to those applicable in Europe and elsewhere in the world. On this particular point, recent efforts in Europe to produce standardized specifications for high-speed services (e.g. Technical Specifications for Interoperability; European standards for design of high-speed railways), a process SNCF has been actively involved in, could be broadly taken as a basis for producing high-speed standards for the U.S. Support of this nature has already been given to the CHSRA in order for it to benefit from European experience.

SNCF completely agrees the opinion, expressed by the CHSRA, that the success of high-speed rail may be largely ascribed to close cooperation with the rolling stock and equipment manufacturer(s) and the operator. To ensure the greatest chances for success, all of these entities need to be involved in the technical specification process from the earliest possible stage.

3.a.6 Operations

In view of the long distances separating U.S. metropolitan areas, SNCF has concluded that an efficient national rail network must be primarily composed of very high speed segments (185 – 220 mph).

In creating such a system, major cities (typically those with more than one million inhabitants) at distances of 600 miles apart could be linked by HSR in less than 4 hours. Experience at SNCF, and among other very high-speed international operators, shows that break-even in terms of intermodal market share lies in this time band. A further stage is reached when travel time is under two hours: with suitably-designed services, HSR can capture 90% of the market and become the main feeder of ridership into the major airports. Active steps will be taken to forge marketing partnerships with any airline operators that might be interested, in order to take advantage of potential complementarities between the modes.

However, we consider that, in the U.S., the main source of HSR ridership will come from the roads and will offer rail customers enormous benefits in terms of time otherwise spent behind the wheel. A shift from automobile to HSR-based travel will also protect the environment, drive down national energy consumption, and dramatically boost transportation safety.

Lastly, SNCF wishes to emphasize its strong conviction that the success of its high-speed rail operations will depend on establishing dedicated track for high-speed service. It is easy to demonstrate that running high-speed trains and conventional passenger trains on different lines is better for all parties. When the co-existence of high-speed trains and other trains is unavoidable, downtown access for instance, the technical aspects of combining old with new, albeit temporarily, will have to be very carefully examined in terms of safety objectives and resulting technical specifications.

We are aware that the specific concerns of the freight operators (and, more generally, the jurisdictions in charge of safety) in relation to the risks of mixed traffic operations, and the need to comply with the provisions of the Railway Safety Improvement Act of 2008 (RSIA).

3.b THE CHALLENGES

3.b.1 Strategy development

While airlines usually serve a few market segments across a vast network, high-speed trains operate on only a few routes. Profitability is therefore dependent on rail's market share, suggesting that trains must be perceived as a viable alternative by a vast majority of travelers – keeping in mind most of those will be first-time users of HSR. In light of this situation, the main marketing challenges will be:

- Defining a simple, understandable transport option that immediately conveys the benefits of high-speed train travel
- Designing and delivering a compelling travel experience for most segments of travelers, keeping in mind the relative complexity of operations
- Removing all hurdles to access: ensuring that the ticket purchase (and exchange) process is simplified and fits in travelers' habits and that station accessibility is maximized
- Ensuring profitable operations by maximizing revenue per available seat.

3.b.2 Operations

High-speed services operate significantly faster than conventional rail traffic, substantially cutting city-to-city trip times. In France, trip times typically were halved upon the introduction of HSR (even when using existing “conventional” infrastructure to reach the city centers). However, high-speed lines must be designed exclusively for high-speed trains for the following reasons: additional safety constraints, operating challenges in optimizing timetables, extra costs of cab signaling equipment for conventional infrastructure and rolling stock, reduced allowances on super-elevation and gradients, and shallower track curves. Those trains have a maximum axle load of 17 metric tons.

Meeting these requirements is best done by placing HSR on separate dedicated tracks which prohibit mixed traffic. Segregation of high-speed service enables operators to achieve higher average speeds and limits the need for additional track to allow for passing. With double track and bi-directional signaling, capacity can be increased and provide up to 15 parallel high-speed paths per hour and per direction. This also lessens the causes of delays and leads to dramatic improvements in train punctuality and the reliability of scheduled services.

Planning a fully “clockface schedule”, with regular interval operations is the best way to optimize the use of infrastructure by means of iterative sequences, which leads to greater predictability and makes train times easy to memorize for both passengers and staff. In turn, such predictability leads to improvements in performance.

Real-time monitoring and managing traffic from a single Operation Control Center (OCC) is vital to achieving the requisite efficiency and responsiveness for high performance. The OCC will be equipped with a Centralized Traffic Control (CTC) System that will control the entire line and its equipment using a computerized electronic interlocking system (EIS). With programmed, automated commands, traffic supervision is made easier and operation in downgraded conditions is improved.

3.b.3 Financial

HSR projects are capital intensive because of the need for new dedicated infrastructure and rolling stock. In addition, the financial risks associated to HSR projects are significant, particularly until revenue is established. Consequently, the financing of the HSR project

becomes one of the main issues to be dealt with by stakeholders and project sponsors. Major financial challenges include:

- Raising sufficient public resources to fund the mandatory public contribution to the financing of the project, in a budget-constrained environment
- Structuring the project in a way that it could be attractive for private partners, and particularly the financial sector, by offering attractive return on investments and risk allocation.

3.b.4 Benefits

Diverting auto riders from highways to high-speed rail will also create large benefits for California. The key issue in California lies in the ability of HST 220 to attract a large number of travelers that are currently using their autos to move through the corridor. Our estimates show that about 79% of the benefits of HSR are derived from auto riders who would shift to HSR.

Most of the business trips taken by automobile – that have just one or two vehicle occupants – command a significant share of the market. High-speed rail in California has a very real opportunity to attract business auto drivers currently traveling by themselves knowing that: (i) the full cost of driving exceeds the fares provided (in average) for HST 220, and (ii) travel times are significantly reduced with HST 220. These benefits accrue to persons choosing to use high-speed rail but also to non-users and are well considered by the public at large.

3.c THE ROUTE

SNCF endorses the alignment proposed by the CHSRA project linking San Francisco Transbay Terminal to downtown Anaheim, passing through Los Angeles Union Station, Palmdale, Bakersfield, Fresno, Gilroy, and San Jose Diridon. A branch will connect Merced and will be prolonged in future phase 2 to Sacramento through Modesto and Stockton. Another branch will connect also on phase 2, LA Union station to San Diego through Ontario Airport, Riverside, Murrieta and Escondido. The alignment is designed in all segments to ensure a commercial speed of 220mph at the start of operations and a possibility to increase the speed to 250 mph if commercially advantageous and technically proven as reliable. The suggested system uses steel wheel on steel track and the infrastructure will be based on an electrified and fully grade separated double track.

The design challenges in delivering a California route design could be:

- Ability to adhere to a high-speed design criteria and geometry in spite of the topographic, and demographic difficulties
- Optimization of the longitudinal alignment in order to obtain the best balance between at grade, aerial, while limiting depressed or tunnel sections. SNCF notes that the Tehachapi pass alignment will be of particular difficulty concerning optimization of the longitudinal profile while endorsing both maximum grade value and length and minimizing tunnel length
- Ability to design structures under high speed dynamic loading and to optimize tunnel size while preserving passenger's eardrum safety and comfort
- Ability to place the alignment through one of the most seismic area of the world while preserving safety of the trains in case of a major earthquake while limiting damages to the infrastructure in order to shorten the service interruption

- Ability to locate a high speed alignment in urban areas while avoiding, to the best possible extent, impacts to adjacent neighborhoods and limiting noise and vibration impacts
- Knowledge of the railway environment in order to be able to construct the high speed line alongside existing infrastructure with a complete analysis of the risks and the appropriate mitigation measures to avoid impacting operation of both high speed and the other services
- Ability to plan, phase and install new signaling and operation management systems alongside existing systems without impacts on safety, operation and existing services.

3.d BUILDING AN OPERATING PLAN

Operations can be divided into three different sections:

- Train operations: scheduling (journey times, number of stops, train capacity, connections, ROW sharing, etc.)
- Operational marketing: fare structure, adjustments to basic operating plan, revenue management (yield management, capacity management)
- Marketing: definition of the customer experience, promotion of service, placement of the HSR brand in the overall marketplace

The first of the above bullets will have a deep impact on costs, the second bullet will have an effect on revenues, and the last bullet will essentially build the perception of value by consumer. While these could seem independent at a first glance, they should, on the contrary, be considered as one single strategy aimed at gaining the confidence of American travelers, serving more of the market over time, and offering the best value for money.

3.d.1 Train operation scheduling, stopping patterns

Service options are tentative and subject to actual demand, but, based upon SNCF's operations expertise, we can provide the following.

Once stopping patterns are determined, SNCF, with state-of-the-art tools, is able to compute trip times, including sufficient recovery time to ensure reliability, and give typical high-speed paths for each of the service types planned in the corridor. Demand for travel between each origin/destination pair provides the basis of the timetable, which must adhere to the "clockface" principle. A balance between non-stop trains and local trains must simultaneously provide high-speed trainsets at the required frequency at all stations without reducing dramatically the capacity of the line and/or speed average of the other trains. Based on a system such as European Railway Train Management System (ERTMS) signaling technology, which provides a 3:30 to 4:00 minute theoretical operating headway, the practical maximum number of trains is set at 15 trains per hour. The scheduled line capacity is closely linked with the stopping patterns chosen, which could reduce this maximum frequency. We assume that as positive train control (PTC) signaling is implemented in the United States, opportunities will become available for the implementation of an ERTMS-like system in the United States that is coordinated with other signaling improvements.

The fleet size is also linked to ridership forecasts. In the event of major fluctuations in demand, SNCF can accommodate additional passengers by operating two-unit consists (at 200m per unit) and increasing fleet availability through operational measures.

HST 220 will cut the travel time by train for most city pairs by more than half. Door-to-door travel time will compete very well with air travel, and will be significantly shorter than automobile travel.

3.d.2 Marketing

The operator will be able to define an overall brand proposition, relevant for those segments with the strongest combined commercial potential, and to translate this brand proposition into a range of services. This may include “hard” services, such as interior design by top designers or web connectivity, as well as “soft” services such as fare conditions or catering. Proper articulation of this double segmentation (market & services) through a strong brand proposition is pivotal to the overall success of operations. SNCF is in a position to bring to the project the unique skills it has acquired from marketing high-speed trains in nine different countries.

The result of this work will be a full range of services which can be reviewed to ensure simplicity. SNCF customers should be able to quickly find the most attractive travel package at a reasonable price. SNCF has started to experiment with dedicating a limited number of on-board class options (between 1 and 3, depending on the route).

SNCF believes that taking the train should be as easy as taking a personal automobile. Virtual ticketing can bring unprecedented flexibility to travelers: all ticket information is kept in a central repository, and travelers only need to carry a form of identification (e.g. cell phone, driver's license) to collect a ticket. They can modify their “ticket” at any time, to change departure time, add or remove services, or even change seats after the train has departed. SNCF also uses platforms compatible with those used by the travel industry, making its products easy to sell by corporate or online travel agencies. It will also be easy to combine air segments, for instance, a round-trip ticket from New York or Tokyo to Merced via SFO Airport.

Once fares and services have been defined, there remains the daily management of demand to maximize revenue per available seat. Capacity in each class of service is fixed: on some trains, demand might exceed capacity, while others might leave the station with unoccupied seats. SNCF was the first rail operator in the world, and continues to be the leader in implementing revenue management systems (initially developed by airlines) to solve this issue, and adapted them to train operations: not only they adjust prices to guide price-sensitive travelers towards less busy trains, maximizing overall load factor and protecting revenue generated by time-sensitive travelers; but they also manage seat allocation based on origin/destination.

3.e ENVIRONMENTAL APPROACH FOR HIGH SPEED LINES

SNCF is aware that the management of environmental concerns is a key element in route selection and can frequently be an issue of debate during the public consultation and outreach phases. Environmental concerns must be taken into account if the project is to be accepted by the stakeholders, including elected officials responsible to residents, businesses and property owners who may more directly impacted by a proposed route than the community at large.

To this end, SNCF will fully observe NEPA's requirements and we are happy to share our experience in meeting the French environmental assessment and public consultation requirements, which are similar to the requirements of NEPA and the FRA. In SNCF's experience, where the benefits of a new HSR lines accrue to the national transportation system and federal environmental policy goals, but localized impacts are inevitable, the

development and adoption of a strong purpose and need statement at the beginning of public outreach process is critical.

SNCF's experience in developing environmental assessments that are oriented to maintaining the core design requirements for HSR, and the particular mitigations that have typically been applied towards this end, will be invaluable to the successful implementation of the project. Associated with this internally driven mandate, it will be necessary to adopt a constructive attitude towards the environmental clearance process and to ensure that all the project disciplines are involved in the applicable environmental issues within prescribed timeframes to ensure that the core HSR program and design criteria are maintained.

This management approach ensures that the definition of the new line will be located within the best possible environmental conditions and that the project will be assessed against such major issues as functionality, environmental impacts and technical requirements. It also integrates a strategic analysis of the overall project.

SNCF's methodology for managing environmental issues is based on very extensive experience, and it reflects approaches and knowledge of environmental design. This system is suitably applicable to our preliminary identification of the main technical issues at stake for the California Corridor, which are typical of other corridors that SNCF has developed and is now operating:

- Preservation of wetlands, their flora, fauna and the activity they shelter
- Need to avoid increasing the risk of flooding and maintaining hydrological transparency
- Compliance with the State regulations on water resources
- No exposure to natural risks (tornadoes, hurricanes)
- Noise and vibration mitigation
- Aesthetic and visual impact mitigation

Examples of how SNCF has approached environmental benefit measurement and mitigation strategies within its HSR projects can be found in Appendix 2

3.f CAPITAL NEEDS ASSESSMENTS

The construction cost (excluding land and including formation, track, sidings and yards, signaling and telecommunications, stations, workshops and other buildings) is estimated to be about **USD 26.5 billion** in \$ 2009 and the value of the land required to be about **USD 1.9 billion** in 2009 dollars.

The cost of the rolling stock is estimated to be about **USD 9.2 billion** in \$ 2009 of which **USD 8.4 billion** will be needed for the initial operation of the railway (2018-2025), with further rolling stock costing **USD 0.8 billion** required to meet the forecast traffic growth (2026-2050).

Figure 1 – Result

Initial Capital Cost	USD 2009 billion	%
Land Acquisition	1.9	5%
Infrastructure	19.9	53%
System	4.5	12%
Stations and Buildings	1.2	3%
Rolling Stock and workshop depot	10.1	27%
Total Capex	37.6	100%

3.g OPERATING AND FINANCIAL RESULTS

Only a detailed legal, technical and financial feasibility study in close cooperation with the US DOT will suffice to exhaust all arguments and assumptions against or in favor of one financial structuring option versus another. The previous Californian RFEI launched in 2008 by The CHSRA addressed these issues and SNCF's answer tried at that time to give the first material in this matter.

All the following results are to be appreciated in the light of the assumptions mentioned and be interpreted as a suggestive approach and methodology to analyze the way Private Sector Participation may be involved in the California HSR.

The table below shows the results of the operation of HST 220, should it be performed by a dedicated Special Purpose Company (SPC), which would receive the farebox revenues, bear the operation and maintenance costs, and supply the Rolling Stock. This operation could generate a contributory capacity which could be use to reduce the funding of infrastructure under terms and conditions to be determined. In present value (USD 2009 discounted at 4 percent) some 43 percent of funds required for the initial capital investments including rolling stock would be generated from operating revenues. Note that cost-sharing arrangements with infrastructure owners and other rail operators are not included in this statement.

Figure 2 – SPC Financials – California HSR

	2018	2022	2030	2040	2050	Total
	million current US Dollars					Current billion USD
Revenues	102	2,083	3,639	5,504	7,046	138.2
Operating Costs	78	548	1,075	1,183	1,302	32.3
Maintenance Costs	89	435	841	926	1,019	25.4
Contributory Capacity	0	242	327	2,173	3,024	40.6
EBITDA	-65	857	1,395	1,222	1,701	39.8
Rolling Stock depreciation	40	232	431	431	431	12.1
EBIT	-105	626	964	791	1,270	27.7
Capital costs Rolling Stock	629	2,991	260	0	0	12.9
SPC Internal Rate of Return (After Tax)						8.2%

3.h THE BENEFITS

The California high-speed rail project will in 2030:

- Benefit travelers by reducing, each year:
Reducing highway travel by 9.1 billion vehicle miles
Reducing air travel by over 3.3 billion passenger miles
Reducing time spent in roadway congestion by over 55 million hours
Reducing deaths and injuries by auto travel by 145 and 11,270 respectively.
- Benefit the environment by reducing annual:
Reducing annual fuel consumption by the equivalent of 177 million gallons of gasoline in 2030
Reducing annual pollutants by 2.4 million tons in 2030.
- Improve California's economy by creating:
154,000 full time jobs over the first years of the project (planning and construction phase)
An additional 300,000 full time jobs over the 30 year operation phase

- Provide a stimulus for development of new industries in California by:

Motivating economic development and growth management activities

Attracting new business and additional tourists to California

Discounted cash flows are calculated over the project life, from the start of the planning and construction phase, i.e. 2011, to the 2050 time period. The Net Present Value (NPV) including the different benefits and the costs of the project (capital investment cost in infrastructure and rolling stock, and operating and maintenance expenses through the ongoing operations) is calculated. The cash flows are expressed in 2009 dollars. The discount rate is the financial return foregone by investing in a project rather than in securities. A 4 percent discount rate has been considered.

The following table summarizes the present value of the benefits and costs and the net present value of the benefit/cost comparison.

Figure 3 – Result of Benefit – cost analysis for California HSR system. Present value in 2009 dollars, discounted 4 per cent through 2050. Total Amount 2011 – 2050

BENEFITS	billion 2009 USD
Passenger revenue	26.6
Benefits to HST 220 passengers	27.7
Benefits to Highway travelers	
Auto congestion reduction	22.7
Auto accident and pollution reduction	5.7
Benefits to Air Travelers	
Air delay reduction	2.5
Air pollution reduction	1.4
Total Benefits	86.6
COSTS	
Capital	27.5
Operation & Maintenance	11.2
Total costs	38.7
Benefit – Cost (Net Present Value)	47.4
Benefit Cost ratio	2.23
Socio-economical Rate of Return	10.8%

This analysis undoubtedly underestimates the true pollution reduction benefit since it only includes reduction in primary pollutants (hydrocarbons, particulate matter, carbon monoxide) from air and automobile travel. Quantifying the benefits of greenhouse gas reduction from reduced auto and air travel and other energy usage will greatly increase the overall environmental benefit; however, greenhouse gas analysis methods are still being developed. Moreover, not all potential benefits were included. For example, the analysis does not include the potential reduction in airport ground access congestion, reduced highway maintenance and capital costs, or the monetary benefits of reduced greenhouse gas emissions. So, SNCF is confident in the estimated benefits because conservative, reasonable assumptions were used throughout.

3.i PROGRAM IMPLEMENTATION

3.i.1 Service implementation plan schedule

Following the current implementation plan developed by the California Department of Transportation, we suggest phasing the project in three successive steps:

- Step 1:
 - San Francisco to Fresno (included branch to Merced) opening to commercial services in 2018
 - Los Angeles to Anaheim opening to commercial services in 2018
- Step 2: Fresno to Los Angeles opening to commercial services in 2020
- Step 3: Merced to Sacramento and Los Angeles to San Diego opening to commercial services in 2025.

3.i.2 Delivering the project

Delivering a large scale project such as a new HSR service that is able to run at speeds over 200 mph has multidisciplinary challenges from initial planning through to the start of operations including track alignment, signaling, catenary and power supply, telecommunications, rolling stock and operations, while ridership benefits are monitored subsequently. HSR development requires global high-speed expertise, including many key sub disciplines. The project approach must be addressed through a global system approach, as every discipline interfaces with the other and any modification in a single discipline can have consequences on the others. The only way to be able to operate a safe, reliable and comfortable service at very high-speed is to manage the project as a whole and absolutely not as an addition of several single skills.

The main challenges to cope with in this kind of project within the systemic approach are as follows:

- Putting together the necessary team with mastery of all the technical skills needed to deliver the project with good management of the flow of disciplinary skill sets during the project
- Controlling the planning and financial aspects of a very large project to deliver on time and on budget
- Organizing all aspects of the delivery of the construction on several fronts:
 - Ability to organize the supply of huge quantity of material on a very long work site without too great an impact on the existing railroad and highway infrastructure and maintain the construction and material markets
 - Contract management
 - Construction quality control
 - Service testing and commissioning
- Managing the environmental clearance process which currently could be sensitive in regard to this kind of large project, as it could face opposition from the grass-root level or through elected officials. Consequently a dedicated team must be in charge of the environmental aspects of the project which itself must have a high level public profile. The biggest priority is to monitor the work site activities and ensure that contractors reach the required quality objectives
- Controlling the construction risks and having an experienced task force able to continually manage the risk assessment program, and to react correctly with a global view of the problem and with appropriate solutions when risks materialize.

SNCF has substantial expertise and experience of this global approach and of all the previously described challenges. This expertise was used for the European Technical Specifications for Interoperability which are the technical requirement basis for HSR. This expertise was built on numerous projects managed by SNCF in France and also all around the world (i.e. Korea, Taiwan, Spain and UK).

3.i.3 Risk management

SNCF has developed a comprehensive methodology for anticipating and mitigating the risks of any kind attached to complex projects like HSR, in project management, construction and commissioning. There are around the world numerous examples indeed of projects delayed and over budget. This methodology combines, on the one hand, engineering expertise and, on the other, in the field experiences and stakeholder objectives.

Control of risk and implementing a risk management plan is especially relevant in projects where responsibilities are shared among a number of parties. Hence, this process once followed enables a smooth and on-time project roll out. The main stages to master are:

- Commissioning the line as designed, in due time, and within budget
- Meeting the technical specifications regarding operational performance, maintainability and reliability
- Implementing stations that meet the expectations of all market segments and local authorities.

4 DETAILED TECHNICAL DESCRIPTION OF THE PROJECT

4.a POPULATIONS OF MARKETS SERVED BY EACH OF THE PROPOSED STATIONS

Traffic from urban areas depends on several factors such as population, economic level, distribution of revenue, value of time. Thus, the following data are used:

Metropolitan Areas - present and future populations 4.a.1

Per Capita personal income 4.a.2

Distribution of revenue and wealth 4.a.2

Regarding the models used aside the existing Californian data (cf paragraph 4.g1), issued from the studies performed by The CHSRA and considered here, it must be recalled that traffic generation is commonly explained by a "gravity-type model", using the following formulas:

Forecasted traffic between two urban areas (i, j) T_{ij} obeys a gravity-type law:

$$T_{ij} = k [P_i^a * P_j^b] / C_g^\alpha$$

where P_i and P_j are the populations of the urban areas (taking into account the income of the populations concerned), A and B are calibrated parameters where $0.8 < A, B < 0.9$ and $1.8 < \alpha < 2.2$, and k is a constant evaluated by linear regression (link between demand = traffic and offer = generalized cost).

C_g is the generalized cost of the mode of transport under consideration.

C_g is the general form: $p + h * t$, p price of the mode considered, h the customer's value of time (VoT). The comprehensive methodology is described in Appendix 3.

This method was used is used by SNCF for its own projects, and can vouch for its accuracy. The method has previously been used for certain US corridors, with the calibration of the above-mentioned parameters being checked against real US cases. (values of a, b, α).

It should also be recalled that, in addition to implementation of the project, detailed market studies will need to be performed in order to adjust these estimates (by client segment in particular), in order to establish market-orientated fare policy.

The stations (and, by extension, areas of population) taken into account are indicated in Section 4.c.

4.a.1 Population Forecasts

This analysis states that the population served by a given station corresponds in broad terms (for the purpose of this study) to the metropolitan area populations.

According to data publicly available, California is the most populous and dense State in the United States with 36.8 millions inhabitants in 2008 and 234.4 inhabitants per square miles.

Figure 4 – Metropolitan area population (in millions)

Metropolitan Area	Metropolitan area population in 2008 (Millions inhabitants)	Forecast Metropolitan population in 2030 (Millions inhabitants)
Los Angeles	17.8	22.4
San Francisco Bay Area	7.2	9.1
San Jose	1.8	2.1
Gilroy	0.5	0.7
Fresno	1.0	1.3
Bakersfield	0.8	1.0
Merced	0.2	0.3
Visalia/Tulare/Hanford	0.4	0.6
Total population of market served in HRS corridor	29.7	37.5

Source: US Census Bureau

4.a.2 Economic analysis

Socio-economic data and forecasts were used to produce ridership and revenue forecasts for High Speed Rail. Ridership development and induced ridership are linked with economic development.

Historic income data are based on US Bureau of Economic Analysis (Department of Commerce). The assumed average annual US GDP growth rate is 2.7 percent through 2025 based on according to OECD² forecasts.

According to the US Bureau of Census per capita personal income in 2007 for the State of California was 42,305 in 2007 USD, ranking 7th in the nation.

The following chart presents the annual per capita personal income in 2007 US dollars during the past years for the metropolitan areas potentially served.

Figure 5 – Per Capita Personal Income in thousand USD

Metropolitan Area	2005	2006	2007	2030
Los Angeles	37.4	39.9	41.9	58.6
San Francisco Bay Area	45.2	57.8	61.3	85.9
San Jose	52.3	55	58.7	82.2
Gilroy	42.1	44.3	46.1	65.7
San Diego	40.4	42.8	44.8	62.8
Fresno	26.1	27.1	28.4	39.7
Bakersfield	25.1	25.9	27.1	37.9
Merced	23	23.2	23.9	33.4
Visalia/Tulare/Hanford	23.7	24.1	25.4	35.5
Stockton	26.3	27.3	28.7	40.2

Source: US Census Bureau & US Governmental Office of Accountability

4.b EXISTING INTERCITY TRAFFIC BY MODE

Several travel surveys (Caltrans statewide survey; Metropolitan Planning Organization regional travel surveys from San Francisco, Sacramento, Los Angeles; 10-percent sample database from the Federal Aviation Administration;) were combined to assess the existing intercity traffic for the year 2000.

The table hereafter gives information about the 2000 daily intercity travel market by mode.

² OECD: Organisation for Economic Co-operation and Development

Figure 6 – Daily Intercity travel market by mode

Market	Auto	Air	Rail	Total
Los Angeles to Sacramento	7,479	4,935		12,414
Los Angeles to San Diego	257,441	100	5,395	262,936
Los Angeles to San Francisco	28,031	26,867		54,898
Sacramento to San Francisco	137,739	25	1,816	139,580
Sacramento to San Diego	175	2,858		3,033
San Diego to San Francisco	4,630	10,309		14,939
LA/SF to San Jose Valley	205,205	3,393	926	209,524
Other to San Jose Valley	281,750	243	344	282,337
To/from Monterey/Central Coast	275,794	3,532	1,105	280,431
To/from Far North	184,506	3,005	16	187,527
To/From W. Sierra Nevada	59,192	668	11	59,871
Total	1,441,942	55,935	9,613	1,507,490

Source : California Statewide High-Speed Rail Forecasting Model run for 2000 "base year" conditions

The size of the market is very large with more than 1.5 million daily trips made along the Corridor Sacramento – San Francisco – Los Angeles – San Diego Corridor,

Auto travel is by far the dominant mode of travel, transporting over 95 percent of daily travelers, i.e., 1 442 000 trips. Capturing just a small proportion of the auto market will thus translate to considerable patronage for the future high-speed rail service. Air traffic accounts for less than 4 percent of the market, i.e., 56 000 daily passengers, and rail traffic are negligible with about half-a-percent of the market.

It should be noted that air services are largely used for long distance trips with a market share of 40% between Los Angeles and Sacramento, 49% between San Francisco and Los Angeles, 69% between San Francisco and San Diego, and 94% between Sacramento and San Diego.

4.c PROPOSED HSR STATION LOCATIONS

4.c.1 Station locations

The tentative station locations, based on the design and development work conducted to our knowledge by CHSRA supplemented by SNCF's own assessments. This design fully supports HSR services and forms the basis for further discussions, in conjunction with the route alignment described in Section 4.1.

Proposed 220 mph California HSR Network and station locations

Station location proposals for the California Corridor are based on a fourfold strategic approach:

- accessibility
- intermodality and connectivity issues
- urban development opportunities
- the existence of historical station buildings.

16 HSR stations are proposed for the California Corridor:

Figure 7 – California corridor HSR stations

	Station area type			Building type	
	Downtown / CBD	Dense urban / suburban area	Fractured urban fabric/ limit of urban area	Historic or existing train station renovated and/or extended	New station building
San Francisco Transbay Terminal					
San Francisco 4th St and King St (Caltrain Terminal)					
Millbrae SFO Airport					
Redwood City / Palo Alto					
San Jose Diridon					
Gilroy					
Fresno					
Merced					
Visalia / Hanford (Option)					
Bakersfield					
Palmdale PMD Airport					
Sylmar					
Burbank					
Los Angeles Union Station					
Norwalk					
Anaheim ARTIC					
Total 16 stations	8	6	2	9	7

14 stations are situated in downtown or in dense urban or suburban areas, 2 at the edges of major cities or conurbations.

SNCF is aware of [potential](#) Caltrain and HST capacity issues within the current San Francisco Transbay Terminal design. Though terminating some trains at peak hours at the 4th and King St Station is considered a possibility, it might become necessary to open up the discussion towards solutions which will allow solving the problem within the perimeter of one single station. SNCF is following the ongoing debate and the proposed alternatives, like double stacking the tracks within the actual Transbay Terminal design, transforming the Terminal to a through station by adding a return loop, or putting the platforms under Beale Street while maintaining the main station entrance and principle services within the actual Transbay Terminal project. We are open to helping to find a satisfactory solution for all stakeholders, including the future commuter and HS train operators and travelers. We believe our perspective from dealing with similar downtown terminal capacity issues will help in finding the most suitable solution.

A more detailed description of each station location is given in Appendix 4.

4.c.2 Station buildings

As stations have become magnets and even driving forces for urban development, their visual impact, the monumental or symbolic nature of their buildings, and their at times daring architectural design have grown in importance. Nowadays, mayors and politicians expect

stations to be visual “business cards” and join the ranks of the outstanding buildings in their cities.



Angers-St Laud Station: Complete restructuring of the city’s main station for the arrival of the TGV, France 1998



Wuhan Station: As one of the biggest new HSR stations in China, the building is already the city’s new emblem - China 2011

Particular challenges exist where classified historical station buildings have to be adapted to new needs. SNCF is fully aware of the importance of maintaining and developing historical station buildings, wherever reasonably possible.



Marseilles-St Charles station: Extending the historical building to integrate the intercity bus station and new shops and services into the HSR terminal - France 2006



Paris-East station renovation: A total overhaul of the 1850/1930 station, integrating 5.000 sqm of new retail outlets for the arrival of the TGV East line - France 2007

Special attention should therefore be given to the use or re-use of historical or existing stations. HSR should be the occasion to bring 21st century train technology to major well-positioned monuments to American railroad history: The San Francisco Transbay Terminal, San Jose Diridon or Los Angeles Union Station will become privileged gateways to their respective cities.



San Francisco Transbay Terminal and Tower project
(Pelli Clarke Pelli Architects)



Los Angeles Union Station

4.d INTERMODAL TRAVEL CONNECTIONS WITH OTHER TRANSPORTATION SERVICES

One of the main success factors of any new rail service, especially HSR, is easy station access for autos, taxis and the different public transportation modes, and of course intercity and regional trains (Amtrak i.a.), local public transportation networks and long distance buses.

From our own domestic and worldwide experience we are fully convinced that careful design of each intermodal hub, respecting the local needs and constraints of each station, is absolutely vital. Beyond this primary objective, the entire travel experience must be as carefully designed and operated as each single station. Thus, good cooperation between the HST operator and its partners will translate into convenient, easy to purchase and competitively priced end-to-end services, and each mode's operations will allow for the others' needs.

The illustrations above and below show examples of urban, architectural and station projects completed by SNCF that have met this goal.



Avignon HSR: A station on the outskirts of a major city, and a new urban development center and major interchange point between car and HSR - France 2001



Shanghai South station: A new HSR railway hub for China's economic capital - China 2006

4.d.1 The station as an intermodal hub

An urgent need exists to reorganize the city inherited from the 20th century with its juxtaposed and layered transportation networks that, over the years, have become increasingly segmented, fragmented and confused. The emergence of new transportation projects like HSR should be seen as an opportunity to rethink and rework this legacy. Redesigning the wider HSR station areas based on general city transportation planning and city development goals will be the first step toward transforming the whole urban transportation network into an integrated multi-modal transportation service offer.

Therefore, all station projects need to focus first and foremost on optimization of stations as intermodal transportation hubs between trains, on the one hand, and urban transportation modes such as subways, trams, buses, taxis, autos (rented and private), plus bicycles and pedestrian walkways, on the other. All these modes have to be linked in the fastest, safest and most convenient way.

4.d.2 Connecting HSR to the existing rail network and local transportation modes

Providing convenient connections with the existing rail network is an obvious target to pursue. Therefore we propose that HSR stations should, wherever possible or realistic, be developed in the vicinity of existing passenger stations served by current carriers. This will reinforce the development of existing commuter and regional intercity passenger rail services and encourage the creation of new services.

Buses, trams, subways: station design has to ensure that all these modes are brought as far as possible into the station complex in order to rapidly absorb the flow of arriving passengers and minimize walking distances from one mode to the next.

4.d.3 Auto access and parking lots

It was emphasized above that the challenge of a new rail service is to maximize the shift of automobile traffic to HSR services. This will be achieved by correctly planning traffic flows in the station neighborhood, adapting street layout, facilitating taxi access, and properly designing taxi waiting areas. Adequate and well-dimensioned parking facilities (with extension capabilities) will have to be provided, operated by a well-chosen operator / partner. Some first indications to help choose the correct parking lot dimensions are set out in appendix 5WW.

4.d.4 Catering to "soft", non-motorized transport modes and new mobility concepts

Managing the flow of pedestrian traffic is an important issue that should be discussed with the city authorities in each case. The aim must be to create a continuum with the urban fabric and ensure the safety of pedestrian precincts in and around the station.

It is also important to think ahead and anticipate on the growing popularity of softer, less environmentally harmful modes, bicycles for example. Space should be earmarked close to stations for cyclists and their vehicles (cycle paths and parking areas) and specific services perhaps proposed (bike rental and sharing, secure parking and repairs).

New mobility concepts such as car-sharing, including electric cars – on the "Zip Car" principle – which currently represent only a small share of the overall mobility market will be vital for tomorrow's mobility and must therefore be encouraged and included in the design equation.

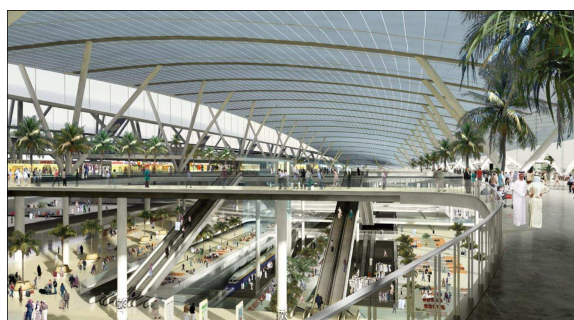
4.d.5 HSR and air travelers

Synergy between HSR and airline operations is a major challenge. HSR can help to reduce airport congestion, by taking over some regional air traffic. This requires well-designed physical connections similar to those already existing in numerous airports over the world. The BART link from San Francisco SFO Airport to Millbrae SFO Airport Station for example should allow for good connectivity.

From a business perspective, fare deals should be agreed with the airlines.



Paris CDG Airport HSR station: every day, more than 5,000 travelers connect from TGV train to plane or vice-versa in France's main air-rail hub - France 1994



Jeddah Airport station project: HSR at the heart of a major international airport – Saudi Arabia 2012)

4.d.6 Impact of multimodality on distribution and operations

HST is at the intersection between intercontinental/continental and local/regional networks and can therefore be either a feeder (generally of a longer air segment) or the main portion of the trip. Customers will naturally tend to purchase the end-to-end journey from the dominant carrier. Airlines should therefore be able to sell the train segment easily (a concept proven by SNCF's TGVAIR: carriers such as American Airlines or Cathay Pacific sell TGV segments

in extension to an intercontinental journey) and the high speed train operator should sell additional services as part of a single transaction (auto rental, local transit, taxi, etc.). SNCF experience, from having worked in partnership with Avis for over 25 years, or operating local transit systems and a taxi fleet in Paris, could be beneficial to the project.

Lastly, the impact of such strong intermodal ambitions on the design of operations is important: coordinated schedules, traveler information (displaying real-time departure gates or local transit information on-board HST for instance), and the ability to handle specific cases (such as delayed connecting passengers) must be developed to offer multimodal travelers a compelling experience.

4.e TRIP TIME AND FARE COMPARISONS

4.e.1 Trip times

This parameter is of paramount importance in that it represents a breakthrough into the HSR era. The maximum speed adopted (220 mph) will slash travel times dramatically as indicated above and mentioned below. High-speed lines are commonly operated at a maximum speed of 185/200 mph. The HS line itself is designed for 220 mph + in order to allow for future technological development over the long span of the project. The average speeds adopted in order to produce a timetable are of course not the maximum of 220 mph.

These assumptions will be reviewed once the alignments have been more clearly established, proper market surveys have been conducted, and Rolling Stock performances are known.

The timetable is based on a clockface service with a minimum of one train per hour in off-peak periods and one train per half-hour in peak periods.

Dwell times have been set to 2 minutes for calls at minor stations (Redwood, Bakersfield for example) and at 3 minutes when calling at major stations (Fresno, for example).

This gives the following theoretical trip times:

Figure 8 – Trip times

To From	San Jose	Fresno	Merced	Los Angeles Union	Anaheim
San Francisco Transbay	30' Non stop	80' 1 stop	95' 4 stops	160' 2 stops	
San Jose		49' Non stop	64' 1 stop	131' 1 stop	152' 5 stops
Fresno			30' Non stop	86' Non stop	107' 3 stops
Merced				173' 5 stops	194' 7 stops
Los Angeles Union					19' 1 stop

An average of 168 miles per hour is achieved between San Francisco Transbay and Los Angeles Union Station with two intermediate stops.

4.e.2 Station services

Services provided in stations must meet the expectations of a variety of clients. The issue is how to make the client feel as much at ease when moving as when not. It should be remembered that stations can also become meeting and even lifestyle areas, where the operator can offer a wide range of services for each customer segment, providing them with a secure environment, everyday commodities and services. In bigger stations, full-scale shopping malls could even be developed. For the travelers, convenient waiting areas, reliable information, business facilities and recreational opportunities should be provided depending on the specific client profile. Special attention will have to be paid to the issue of luggage, since these days passengers tend to be increasingly heavily laden. Left luggage and obstacle-free passages are essential for easy and comfortable movement.

The advent of virtual ticketing (combined with self-service machines for ticket exchanges or multi-operator vending machines) will facilitate the purchase process for the client reduce the number of sales staff and size of sales areas in stations (ticket counters and back office). Sales staff redirected to client service will smooth transfers through the station, offering personalized information, special care for passengers with particular needs. On this latter point, SNCF is well acquainted with ADA regulations (see section 8.d below), which are quite similar to current European standards. Stations must offer easy access to all clients, including the disabled (sight, hearing, intellectual or mobility impaired) by installing the necessary equipment (elevators, ramps, escalators, dedicated restrooms, suitably adapted ticket counters, etc.) and having properly trained staff. All these services, combined with reliable, clean installations (lighting, left luggage, elevators, escalators, restrooms, etc.), must contribute to creating a place where travelers feel safe and at ease, reinforcing the station's appeal, not only as a departure point but as one of the city's most lively venues (see appendix 6).

Finally, station design has to be conducive to passenger flow and intermodal mobility. The various areas within the passenger building have to receive and orientate customers between their points of access, whatever their mode of travel, and the train. These areas consist of the main concourse, the various passageways, galleries, underpasses and overpasses that serve to ensure the flow of arriving, departing and transit foot traffic and offer waiting areas for those with time to spare. All these areas are designed to enable seamless movement, offer convenient signposting and passenger information, while echoing the building's architectural theme.

4.e.3 On board services

Time spent on-board is a critical part of the overall travel experience, and is usually a key asset to win customers' preference. The first step is to undertake a comprehensive review of the current travel market and its trends, including all elements that could influence decision-making (like the predicted evolution of morphology). Once customers needs have been identified (eventually by the customer experience team with service specialists from different industries (high-speed rail, airlines, hotels, etc.), it will be possible to design an overall service architecture, focusing on the key selling points (comfort, convenience, human dimension, etc.) and reflecting the brand proposition. High level American designers will be selected to design the physical train interiors.

The on-board design will obviously also comply with ADA requirements as mentioned for the stations.

4.e.4 Fares

In the same fashion, an in-depth market research is pivotal in building a fare range (the modeling performed as described in paragraph 4 and fare policy are not mutually exclusive). The fare range will have to meet several objectives:

- Ensure overall attractiveness of HST 220 versus competing modes for each segment of travelers (based on their preferences and price-sensitivity), i.e. overall volume
- Maximize revenue per available seat
- Create new standards of simplicity (easy to choose, purchase, exchange...).

In a given business case frame there is room for optimizing volume / level of tariffs according to goals set by the Authority, insisting either on volume, profitability, minimization of financial costs, etc. An example of this trade off will be given in section 4.q.

4.e.5 Comparisons with other services

For trips between California's major metropolitan areas, high speed trains would provide very competitive services as compared to other existing modes of transportation, including very competitive travel times and fares. Travel times, costs, frequency of service, and on-time arrivals are the most important issues affecting a traveler's decision to travel by air, auto or rail.

Travel times and cost have been developed for each available mode between each origin-destination pair in 4,667 zones within the State for normal current driving conditions. No extra time has been added for future congestion. For the auto mode, driving time and cost were calculated, as well as parking costs for business areas. For air and rail, times and costs were calculated for the part of the trip on the plane or train as well as for other components such as access time (getting to and from the station or airport), terminal entry time (parking if driving, check-in, and passing through security), waiting time (waiting for departure, boarding and waiting for plane to leave the gate), terminal exit time (time to disembark, collect any luggage, reach a parked auto, taxi, transit or rental car) and egress time (getting to the final destination).

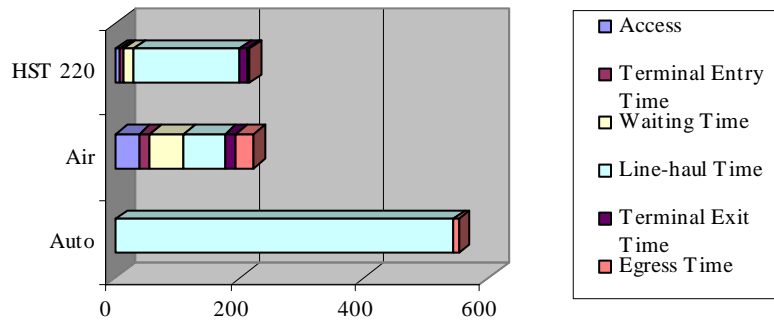
4.e.6 Door-to-door travel times - examples

The competitiveness of the different modes can be seen in the figure below showing door-to-door travel times for three representative travel markets:

San Francisco to Los Angeles

High-speed rail would be competitive with air on travel times for San Francisco to Los Angeles due to nearly identical door-to-door travel time, and would be more than two times faster than auto. This is a core market for which high-speed rail will compete well.

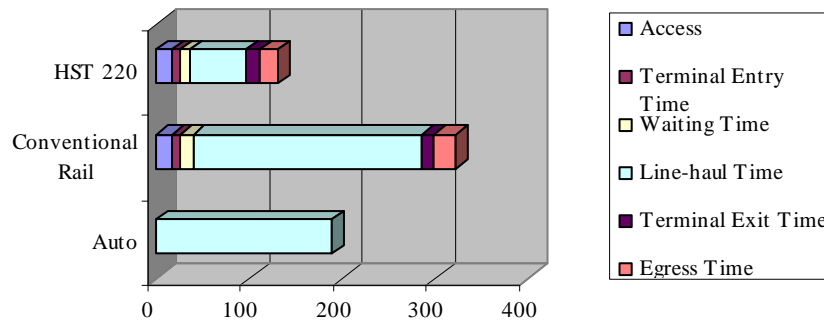
Figure 9 – San Francisco – Embarcadero Center to Los Angeles – Civic Center travel time, via HST 220, Air, or Auto, in minutes



Merced to Mountain View

For Merced to Mountain View, a relatively short trip, automobile would be an hour longer than high-speed rail but would have an advantage on availability, and would compete well, depending on the relative costs and the size of the traveling party. Conventional rail seems out of the market with a door-to-door travel time in excess of more than three hours compared to high speed rail and two hours compared with auto

Figure 10 – Merced (UC Merced campus) to Mountain View (located in Northern California, about 40 miles south of San Francisco and about 15 miles north of San Jose) travel times, via Conventional Rail, High-Speed Rail, or Auto, in minutes at Peak Hours.



4.e.7 Travel costs

Total trip costs are primarily due to line-haul costs, but also include access and egress costs, including parking charges and tolls. This is in fact the "generalized cost" mentioned in section 4.a.

Future auto driving costs were based on a gasoline price of \$2.93 per gallon (compared to the current price of about USD 2.79 in August 2009), average auto occupancy of 1.4 persons and miles per gallon of 21.9. They also include minor maintenance and are assumed to remain constant through 2030, resulting in a cost of USD 0.22 per auto traveler-mile.

Air fares were taken from the Federal Aviation Administration 10 percent ticket sample data of actual fares paid in 2005, averaged for all trip purposes. Airport parking charges per trip were based on the daily cost of parking at airport-related facilities in 2005, ranging from USD 6 to USD 25.50.

Conventional rail fares are assumed to be equal to the cost of a multi-ride ticket.

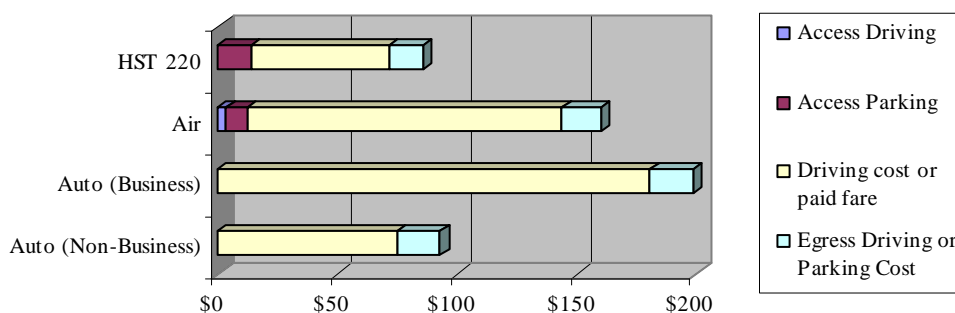
High-speed rail fares were set at 50% of average air fares when the air mode is present. For other trips, fares were then derived from this fare on a per-mile cost formula. Parking costs near stations have been added.

4.e.8 Door-to Door costs examples

The relative competitiveness of the different modes can be analyzed via the following figures showing door-to-door costs (as the sum of access driving costs to the station or airport, parking fees at the airport, the cost of driving or fare paid, and the egress cost to final destination or parking fees) for three representative travel markets:

San Francisco to Los Angeles

Figure 11 – San Francisco (Embarcadero Center) to Los Angeles (Civic Center) travel cost (2008 dollars) via HST 220, Air, or Auto.

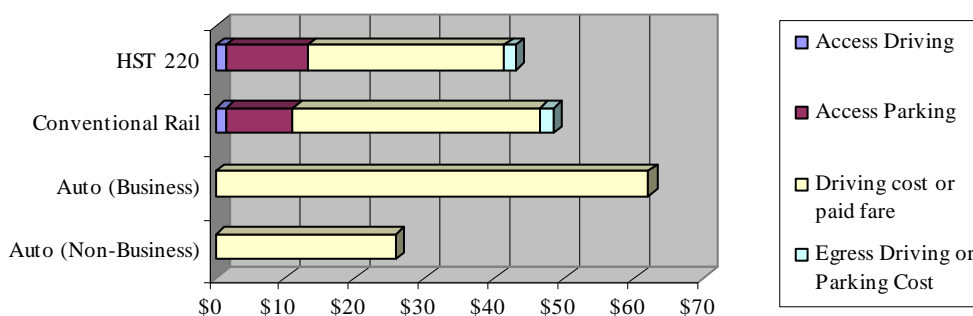


For comparison purposes, ownership auto costs (including gasoline cost, tolls, maintenance as well as taxes, depreciation, finance charges, registration, insurance, etc.) are also indicated. They are representative of the costs incurred by firms for business trips and were evaluated at USD 0.53 per auto traveler mile.

As can be seen high-speed rail would be cheaper in cost to driving for (business or non-business) travel between San Francisco to Los Angeles and both would be substantially less expensive than air travel, almost twice as cheap for high-speed rail.

Merced to Mountain View

Figure 12 – Merced (UC Merced campus) to Mountain View (located in Northern California, about 40 miles south of San Francisco and about 15 miles north of San Jose) travel cost (2008 dollars) via auto, conventional rail or high-speed rail



For Merced to Mountain View, a relatively short trip, automobile would be clearly the most economical, USD 22 cheaper than high-speed rail, for a non-business trip, but USD 20 more expensive for a business trip. High-speed rail would remain one hour quicker.

All these figures are based on average values. State-of-the-art management techniques will enable each passenger to enjoy the best value for money in relation to his or her journey purpose.

4.f OPERATING PLAN

4.f.1 Train operation scheduling

Trip times have been calculated using the principles generally adopted at SNCF. A 5% recovery margin is added to the basic trip time on punctuality grounds, so that normal operations can, as far as possible, be resumed in the event of disruption. Dwell times of 2 minutes at minor stations and 5 minutes at major station have been taken. The resulting trip times were given in paragraph 4.e.1. As already mentioned, an average of 168 mph is reached between San Francisco Transbay and Los Angeles with two intermediate stops. This “flag” average speed could be understood with the reduced dwell times planned at both San José and Fresno and the non call of the SFO Airport stations. Otherwise averages between 107 and 130 are the norm depending on the stopping patterns.

4.f.2 Train capacity and service frequency

The basic trainset capacity (see 4.o) taken as a working assumption is 500 to 550 seats. Train consist can be adapted (split or coupled) to match demand and operation.

This preliminary study presents a conceptual clockface plan providing 4 hourly and services (half-hourly during peak hours) between SF to LA Depending on services, 9 intermediate stations will be served between San Francisco and Los Angeles and 3 on other sections or lines.

Efficient signaling technology such as that contained in European standards (for instance ERTMS) allows theoretically operating headways of 3’30’’ to 4’ (time interval between two successive trains). Therefore, some 15 trains per hour can in practice be scheduled.

4.f.3 Stopping patterns

The choice of stopping patterns is an important feature of operating strategy, as it will impact on high-speed system design (track layout in stations, signaling system, rolling stock performance), operations, costs (of a technical nature such as brake wear or power consumption or operational, for traveling personnel), and revenues and, ultimately, the attractiveness of the service. A balance must be struck between rapid service and multiple stops from the findings of market research.

4.f.4 Station capacity and maintenance depots location

The Peak Hours service will determine the number of platforms needed at termini. Platform length is provided for serving 2 trainsets (coupled). The location of the maintenance depot should be fixed in relation to the operations. For intermediate stations, the number of daily round-trips will determine the station lay out (number of tracks / platforms).

4.f.5 Train service

According to the passenger forecast traffic it is recommended to operate single unit consist during the first stage of the project in order to increase the offer and to provide hourly departure during off peak periods and half hourly services during peak periods. Once the whole high speed line is implemented, the 2021-2023 (figures given in brackets) and the 2024-2050 timetables are planned to offer four types of services per direction to meet demand:

Four types of service are proposed per direction to meet demand:

- 31 (21) daily services between San Francisco - Transbay and Los Angeles - Union (449 miles - 160 minutes travel time with two intermediate stations. Clockface timetables will provide an hourly service during off peak hours and a half hourly service during peak periods and flank peak periods
- 100 (60) daily services between San Francisco Airport and Anaheim (458 miles - 207 minutes travel time) global stopping at most of the stations. Clockface timetables will provide a half hourly service during the whole day with some additional peak hour trains
- 17 (17) daily services between SF Transbay and Merced (174 miles - 95 minutes travel time calling at all intermediate stations). A whole day hourly service is set
- 17 (17) daily services between Merced and Anaheim (340 miles - 194 minutes travel time calling at all intermediate stations. A whole day hourly service is foreseen.

Paths provided by the four services will be designed to provide a fully clockface offer during the off peak periods as well as clockface connections. Some regular interval trains will be added to this skeleton to increase the service offered during the peak periods.

4.f.6 Operations management

A key element in the efficient and reliable operation of a railway line is real-time traffic management and monitoring from an Operation Control Center designed to control all the equipment on the line. The OCC will be equipped with a Centralized Traffic Control (CTC) system, thus enabling it to:

- Operate signaling equipment and switches, and set routes by remote control
- Cope with expected traffic movements, monitor them in real time at stations and on the line, and quickly take adequate measures to re-establish normal operation in the event of disruption
- Cater to works on the track, either scheduled or in of the event of an emergency
- Monitor and manage the use of rolling stock via direct links to depots and stations in order to provide the best possible service
- Monitor and manage on-board staff in order to provide the best possible service
- Provide information to clients through the PIS & PA systems.

The Operation Control Center will have to handle:

- Real time operations management, which includes:
 - Train supervision (HST plus maintenance trains) and delay mitigation measures
 - Infrastructure operation management
 - Track and railway equipment maintenance programs
 - Real-time rolling stock fleet management (failure mitigation measures).
- Train engineer management:
 - Real-time management (in the event of delays)
 - Technical support (hot line, in of the event of failures)
- On board staff rosters
- Passenger information in stations.

4.f.7 Intermodal Connections

The intermodality issue was addressed in section 4.d above and appendix 7. Intermodality relates to:

- Conventional rail (Intercity and regional services), where ridership will be dramatically eased by the development of HSR
- Ground public transportation, in conjunction with urban development plans
- Auto accesses, parking facilities
- Soft mode management
- Strategic planning.

4.g ANNUAL RIDERSHIP AND REVENUE PROJECTIONS

4.g.1 The California High-Speed Rail Authority ridership modeling process

As briefly mentioned in section 4.a, an extensive peer review of the ridership study performed by Cambridge Systematics³ for the California High-Speed Rail Authority has been made. The peer concludes that the methodology and the assumptions used to produce ridership estimates for high-speed rail are appropriate and reasonable at such a preliminary stage for a traffic forecast study. Some refinements should be developed in a next stage such as the modeling methodology of the induced demand or the optimization of the high-speed rail fares that seem in the lower range.

Given that results can be considered to be credible and reasonable at this stage of the project, they have been used to develop ridership and revenue projections for the San-Francisco to Los Angeles (Anaheim) high-speed rail service. Nevertheless, it ought to be assumed that the success of high-speed rail in California will not simply lie in the use of advanced rail technology for its own sake. It will also depend on the ability of the new service to attract riders traveling for a large variety of purposes to choose HSR from the many travel options at their disposal as the solution best able to meet their needs and preferences. Variables that affect choice include competitive travel time, cost, frequency, but also accessibility, comfort and departure time preferences. Attracting these fare-paying passengers in forecasted numbers to sustain a profitable operation will be a vital factor.

First years of service: 2018 – 2020

The expected high-speed rail ridership for 2018, the first full year of passenger service between San Francisco to Fresno and Merced is 3.0 million passengers. A 2- to 3-year transition period, called as ramp-up period, is anticipated during which ridership increases from zero to approach the level predicted by the models. Ridership projections for 2020 are 8.5 million passengers for the San Francisco – Fresno / Merced corridor.

Implementation of the Fresno-Los Angeles-Anaheim corridor in 2021 and ridership growth during the 2021-2024 period

When the Fresno-Los Angeles-Anaheim segment is implemented, frequency will considerably increase and traffic volumes will ramp up to expected levels as more travelers become aware of the new mode that connects San Francisco Bay to Los Angeles Basin through San Joaquin Valley.

³ Bay Area/California High-speed Rail Ridership and Revenue Forecasting Study prepared by Cambridge Systematics Inc for the Metropolitan Transportation Commission and the Californian High-Speed Rail Authority, August 2007

Developments on the California transport market beyond 2021 are highly dependent on the natural growth of the market and traffic generation. The predicted growth in high-speed rail traffic is based upon experience gained from the successive introduction of services on new high-speed rail lines in Europe. This experience shows that high-speed trains capture a large part of existing traffic and retain it. It is possible, knowing the breakdown of high-speed train ridership in terms of travelers who previously used automobile and air, to estimate the increase in California high-speed rail traffic from the growth in mobility of those travelers previously using other modes.

The expected high-speed rail ridership for the first year of full operation San Francisco and Anaheim in 2021 is 22.3 million passengers. After a 2- to 3-year ramp-up period, ridership will reach 49.3 million passengers in 2024.

Steady Operation during the 2026 – 2040 period

During this 2026-2040 period, the market will be driven by natural economic growth, characterized by population and employment trends, anticipated to be about 1.7 percent a year. In 2030, ridership will reach 54.6 million passengers. The three main markets would gather 26.4 millions trips:

- 10.8 million passengers between San Francisco Bay and Los Angeles Basin
- 8.3 million passengers between San Joaquin Valley and Los Angeles Basin
- And 7.3 millions passengers between San Joaquin Valley and San Francisco Bay.

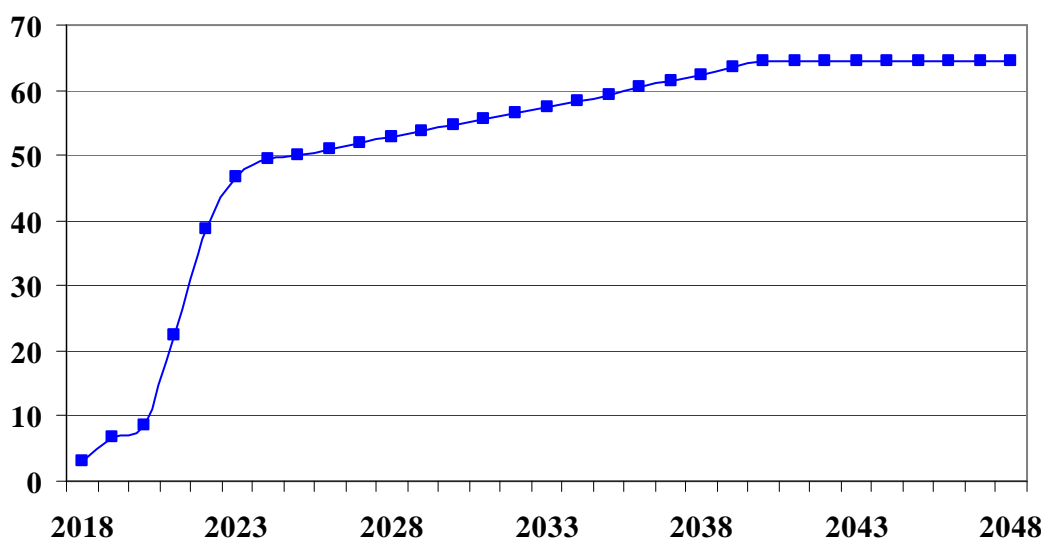
After 2040, it is assumed that there will be zero growth in the market since socio-economic forecasts are not available this far ahead available. This estimate is quite conservative for project economics.

Sources of ridership

The model calculates the total ridership by demand type: diverted trips and newly created demand. Diverted inter-regional trips made by users who previously used a different mode account for about 98% of total system demand (74% from auto, 17% from Air and 7% from conventional rail). Newly created demand represent new passengers, who would not have traveled before the high-speed rail service, and former users of air services, automobiles or conventional rail, who travel more with the new high-speed rail system. It is clear that high-speed rail will introduce a new transport service that can meet previously unmet individual travel needs with competitive fares, attractive and fast travel times, high frequency and improved comfort. New created trips represent, according to existing studies, only 2% inter-regional high-speed train trips, which is quite low, especially when taking into account the low fare level (set at 50% of the air fares) of the new high-speed rail service.

The following figure, and appendix 11, show the annual ridership projections for the San-Francisco to Los Angeles (Anaheim) corridor from the start of revenue service in 2018 to the horizon year of 2050.

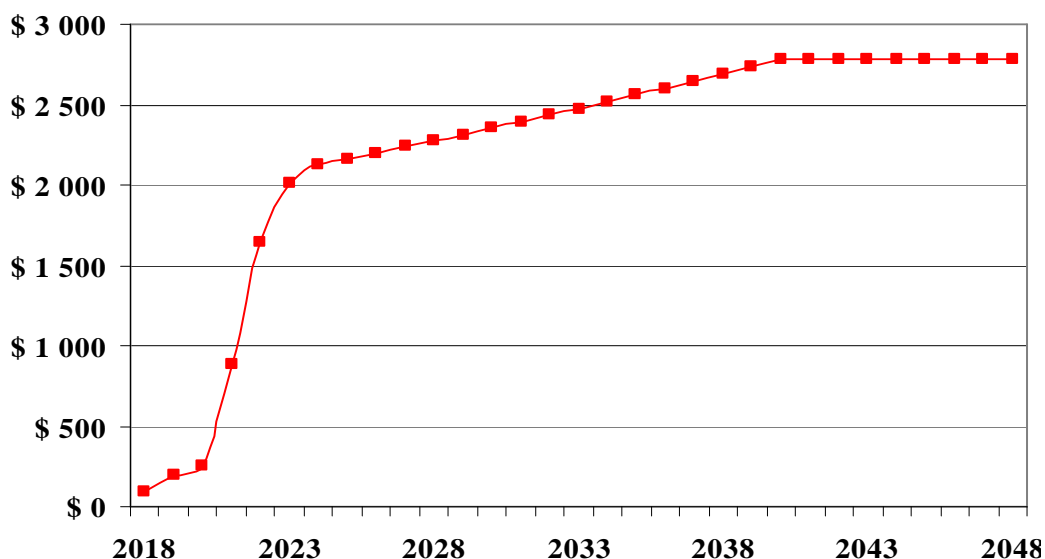
Figure 13 – Ridership for California HSR Project (millions of riders)



4.g.2 Revenue analysis

Revenue forecasts are presented in the figure below and in appendix 11. These revenues are based upon the fare structure developed for the California high-speed rail service and previously described in section 4.e of this chapter.

Figure 14 – Revenues for California HSR Project (millions \$2008)



The total revenue for the year 2028 amounts to USD 648.7 million (2008 dollars) as shown in the table below: The total revenue for the year 2030 amounts to USD 2,355 million (2008 dollars). The three main markets provide USD 1,436 million in revenue:

- The San Francisco Bay to Los Angeles Basin market generates USD 735 million in revenues
- The San Joaquin Valley to Los Angeles Basin market generates USD 355 million in revenues
- And the San Joaquin Valley to San Francisco Bay market generates USD 346 million in revenues

4.h OPERATING COSTS

Operating expenditures have been assessed for passenger traffic and infrastructure/other operations. Unit costs are developed for each of the main cost components that are generally either traffic related (per train miles or train hour) or operation related (number of staff, capital cost of buildings). Costs are based on international practice and include both with operating and maintenance costs.

4.h.1 Operating cost estimates

Drivers, Conductors, Traction power, Platform, OCC and station staff, Catering, Fare collection (ticket delivery, sales and after sales), Marketing, Information, Security, Insurance and Clerk costs are included under operating costs.

Some of operating costs are directly related to the number of train miles and train hours operated (on board staff, traction power, etc.), while others are assumed to be only indirectly related to actual transport tasks (number of staff per station).

An outline service pattern has been assumed for the periods 2018-2020, 2021-2024 and 2024-2050 and this gives an estimated 30 daily services in 2020, 90 in 2024 and 150 in 2039.

4.h.2 Infrastructure and Rolling Stock maintenance costs

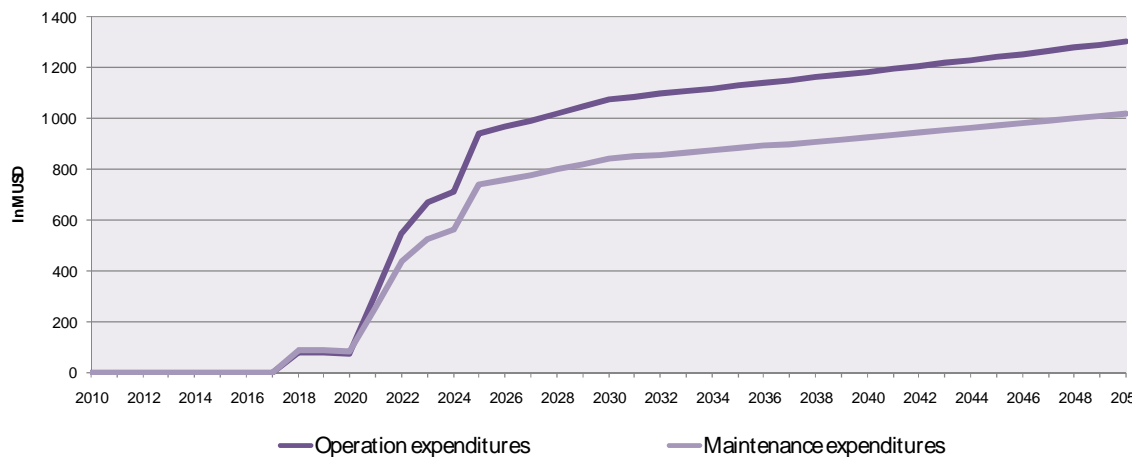
The following costs are included under maintenance costs:

- Fixed costs (civil works maintenance, Operation Control Center (OCC) maintenance, general inspections using track and other recording vehicles)
- Costs related to unit*miles, for example power supply maintenance, track maintenance, catenary maintenance, signaling maintenance, telecom maintenance
- Rolling Stock maintenance costs.

4.h.3 Productivity factor and final results

The annual forecasts of operation and maintenance expenditures over the project period have been calculated with an expected productivity factor estimated on average at **-4.0%** per year over the first four year of operations (due to the learning curve) and **-1.5%** per year after.

Figure 15 – Operation and maintenance expenditures in current values and with productivity factors



4.i IMPACT OF THE PROJECT - PUBLIC BENEFITS

The Californian high-speed rail project would have a significant impact in terms of:

- Jobs creation (HSR construction and operation)
- Economic stimulation (new transportation capacities, in particular encouraging tourism)
- Time, cost, and energy savings
- Greenhouse gas emission reduction.

These benefits accrue also to those who may not use a particular transportation facility.

The benefits are determined on the basis of the best current estimates of the ridership and the performance characteristics of air, auto and high speed rail travel.

4.i.1 Major benefits of the high speed rail system to the public and the transportation system

The California high-speed rail project will in 2030:

- Benefit travelers by reducing annual
 - Highway travel by 9.1 billion vehicle miles
 - Air travel by over 3.3 billion passenger miles
 - Time spent in roadway congestion by over 55 million hours
 - Deaths and injuries by auto travel by 145 and 11,270 respectively
- Benefit the environment by reducing annual
 - Fuel consumption by the equivalent of 177 million gallons of gasoline in 2030
 - Pollutant Emissions by 2.4 million tons in 2030
- Improve California's economy by creating:
 - 154,000 full time jobs over the first years of the project (planning and construction phase)
 - An additional 300,000 full time jobs over the 30 year operation phase
- Provide a stimulus for development of new industries in California by
 - Motivating economic development and growth management activities
 - Attracting new business and additional tourists to California.

4.i.2 Methodology

When evaluating the benefits to users, account was taken of consumer surplus, system revenues, and resource savings that provide benefits to the general public, such as congestion and emission savings.

The economic forecasting and assessment techniques used are those approved and used by the U.S. Department of Transportation/Federal Railroad Administration (FRA). In addition, this methodology has been accepted by other federal, state and local government authorities as a process for justifying public investment in transportation projects. The computation of the high-speed train's benefits is also consistent with guidance provided by the Environmental Protection Agency (Guidelines for Preparing Economic Analyses) and the Federal Highway Administration (Economic Analysis Primer).

As explained in section 3, this REFI follows on logically from President Obama's stimulus plan. The figures given for the number of jobs created have therefore been obtained by taking the general US economic model and calculating both direct and indirect impacts, the latter to allow for the Keynesian multiplier factor (knock-on effects on trade, tourism, auto hire, etc.).

It is also generally accepted that the American economy creates more jobs per dollar invested than European economies.

Conservative, reasonable assumptions were used throughout, and not all potential benefits were included. For example, the analysis does not include the potential reduction in airport ground access congestion, reduced highway maintenance and capital costs, or the monetary benefits of reduced greenhouse gas emissions.

Highway congestion

The use of the California high-speed rail system will free up capacity on existing highways by reducing yearly highway travel by over 9 billion vehicle miles in 2030 reducing time spent in roadway congestion by over 55 million hours per year.

Aviation congestion

Aviation sector savings are due to reduction in travel delays to air users. Over 3 billion passenger-miles will shift from air to HSR.

Energy consumption

Based on the forecasted 2030 conditions, the HSR service will reduce transportation energy consumption by 177.5 million gallons of gasoline or 4.2 million barrels of oil or 18.3 trillion British thermal units.

Pollutant emissions

High-speed rail will reduce pollutants due to travelers shifting from either auto or air travel. The following presents changes in tons of pollutants for 2030:

Figure 16 – Net Reductions in Air Quality Pollutants (tons) in 2030

	Auto	Air	Total	HST 220	Net
Carbon Dioxide (CO ₂)	2,018,150	630,518	2,648,668	726,877	1,921,791
Carbon Monoxide (CO)	127,884	166,373	294,257	159	294,098
Hydrocarbons (HC)	17,238	130,422	147,660	18	147,642
Nitrogen Oxides (Nox)	8,894	6,319	15,213	3,365	11,848
Particular Matter (PM)	1,072	937	2,009	581	1,428
Sulfur Dioxide (SO ₂)	724	1,401	2,125	5,056	-2,931
Tire Wear Matter	1,101		1,101		1,101
Total		935,971	3,111,033	736,056	2,374,977

Safety

Internationally, high-speed rail has attained an exceptional safety record which is assumed to continue in California operations. Historical trends in air and auto safety are used as a basis for determining the number of accidents, injuries, and fatalities that might be avoided by the shift of travelers to high-speed rail.

Figure 17 – Safety

Type of Impacts	Annual Impact for 2030		Cumulative Impact for 2020 - 2050	
	Auto	Air	Auto	Air
Reduced fatalities	145	1	4,636	36
Reduced injuries	11,009	0	352,303	9
Reduced accidents	11,270	1	360,647	18

4.i.3 Benefits to cost analysis

High-Speed Rail Users' Benefits

The benefits to users of the high-speed rail system are the sum of the consumer surplus and system revenues:

- Consumer surplus is used to measure the broad economic impact of a transportation improvement. Consumer surplus is defined as the additional benefit consumers receive from the purchase of a service above the price actually paid for that service and is estimated from the difference in generalized costs between high-speed rail and the traveler's previous mode
- System revenues reflect additional consumer surplus benefits to users of the system, benefits for which they pay directly. The decision to include revenues in a benefit-to-cost analysis (as approved by the U.S. Department of Transportation) is based on the notion that revenues are a proxy for the increase in consumer surplus generated by a travel option.

Benefits to users of other modes

In addition to high-speed rail users' benefits, travelers using other modes will also benefit from the high-speed rail service, as the system will contribute to relieving highway congestion and reducing travel times for them:

- Airport congestion savings: Air travelers diverting to the high-speed rail service will reduce congestion and delays on both local and national air systems. This benefit is used to place a value on the savings made by both passengers and the airlines in terms of reduced delays
- Highway congestion savings: Auto travelers diverting to the high-speed rail service will reduce congestion and delays on highways.

Benefits for the public at large

Emission savings: The diversion of travelers to rail from the auto mode helps drive down emissions (air pollutants) in the interests of the public at large.

Benefits to Costs analysis

Discounted cash flows are calculated over the project life, from the start of the planning and construction phase, i.e. 2011, to the 2050 time period. The Net Present Value in 2009 dollars (NPV) includes the different benefits and the costs of the project (capital investment cost in infrastructure and rolling stock, and operating and maintenance expenses through the ongoing operations). The discount rate considered (4 percent) is the financial return foregone by investing in a project rather than in securities.

Figure 18 – Result of Benefit – cost analysis for California HSR system. Present value in 2009 dollars, discounted 4 per cent through 2050. Total Amount 2011 – 2050

BENEFITS	Billions of 2009 dollars
Passenger revenue	26.6
Benefits to HST 220 passengers	27.7
Benefits to Highway travelers	
Auto congestion reduction	22.7
Auto accident and pollution reduction	5.7
Benefits to Air Travelers	
Air delay reduction	2.5
Air pollution reduction	1.4
Total Benefits	86.6
COSTS	
Capital	27.5
Operation & Maintenance	11.2
Total costs	38.7
Benefit – Cost (Net Present Value)	47.437
Benefit Cost ratio	2.23
Socio-economic Rate of Return	10.8%

The California HSR project presents a cost-benefit ratio of 2.23. Net Present Value is estimated to be \$47.4 billion, and the socio-economic rate of return is evaluated at 10.8 percent. This means that by 2050, California will realize \$86.1 billion in present value of benefits – doubling the total present value of the project.

Not only will high-speed train passengers benefit from the system, 37 percent of the benefits will be enjoyed by the public at large in the form of reduced delays, reduced air pollution, and reduced auto accidents and fatalities.

4.i.4 Other benefits

Economic Development

This item addresses the direct and indirect changes in employment, income, and business activity that would be attributable to constructing and operating the California HSR. These impacts result from new money stimulants to the California economy that would otherwise not exist.

154,000 jobs and \$10.0 billion in wages and salaries will be created by the high-speed rail project during the planning and construction phase. An additional 330,000 jobs and \$21.5 billion in wages and salaries will be created over the period of operation. These jobs would be distributed broadly across most sectors of the economy.

Urban (re)development and land value

High-speed train systems typically act as a catalyst to strengthen urban centers, promote more compact development around stations, and even increase local property values.

A high speed rail station is a powerful lever for city (re)development and sustained economic growth, as examples in France and many other countries show. Train connections provide new job and business opportunities by making previously remote areas more easily accessible. They spur investment in offices, hotels and housing, as well as in public facilities and services.

4.j IMPACT OF THE PROJECT ON GROWTH OF EXISTING SERVICES

The development of the high-speed rail network will help boost passenger train traffic on both intercity and commuter services. Indeed the growth of global traffic generated by transfers from other modes (autos and planes) towards high-speed trains will also be profitable to existing rail passenger services as feeders for high speeds. SNCF will therefore engage in discussions with the authorities (CHRSA) and existing rail operators (i.e. Amtrak, Caltrain, Metrolink, UP, BNSF, etc.) in a bid to coordinate services and jointly organize stopping patterns and timetables.

Subjects that SNCF could usefully address, with a view to increasing business all round, could be:

- Use of existing stations in order to connect with existing service for example:

Connection to the Caltrain services in San Francisco Fourth&King, Millbrae and San Jose Diridon

Connection to the BART services in Millbrae

Connection to Amtrak Services in San José Diridon, Gilroy, San Jose, Bakersfield and Los Angeles Union station

Connection to the Metrolink services in Los Angeles Union Station / Anaheim

- Connection with San Francisco SFO Airport by extension of the Airtrain to Millbrae station
- Knowing the agreement linking the CHSRA and Caltrain SNCF endorses upgrading the Caltrain corridor and proposes a common operations management set-up.

The existing railroad companies will benefit from the modernization of the network carried out for the high-speed projects by raising speeds, improving the safety, removing grade crossings, installing modern PTC signaling systems and modern operations control. All these improvements will enable better capacity and regularity on the network and improve the

global quality of existing railroad services with the consequent knock-on effects on ridership levels, creating a virtuous cycle that will bring more and more people to rail.

For freight operators, the advent of high-speed passenger services will impact positively on their businesses; even if current safety rules preclude operating a mixture of freight and high-speed passenger trains, even though in a long term perspective, it will be desirable to separate these two types of traffic (as stated in paragraph 4.k.3).

Anyway, two main factors will be the base of freight growth:

- The first will be the transportation needs induced by massive investment in rail transportation. First of all, there will be the construction and maintenance materials for the high-speed line; but also the material required by rolling stock manufacturers, rail manufacturers and the railroad industry as a whole. The huge quantity of first raw materials and then manufactured products that will have to be moved for the different projects will offer new development and growth opportunities for freight railroad operators
- The second factor will come from the global improvement in railroad infrastructure quality. The new infrastructure combined with modern operations management will free new capacities for the railroad network and open up possibilities for traffic growth. Infrastructure modernization and the transfer of passenger trains to dedicated high-speed ROW should create great opportunities for freight traffic development.

4.k IMPACT OF THE PROJECT ON OTHER RAIL SERVICES

SNCF acknowledges that taking into account the impact of HS services on other rail services (freight, intercity and commuters) in the USA is one of the key elements for the success of the project. Moreover SNCF has unique expertise in dealing with this kind of problem as high speed services worldwide operate mostly on dedicated infrastructure. The problem can be analyzed from three angles: services, operations and infrastructure.

4.k.1 Services

It is clear and essential that other services should not be jeopardized by the development of high-speed train services. They must not have a negative effect on existing services either in operating terms or as regards reasonable foreseeable development possibilities. Moreover they should as far as possible contribute to the development of these other services.

It is expected that high-speed services will attract passengers from other transportation modes and mainly from autos and planes. But the real benefit of a high-speed service comes when there is enough space between stations to reap the full effects of speed and thereby achieve substantial time savings.

The high-speed network must therefore be fed by other transportation modes. In order to capitalize on rail as an environmentally friendly transportation mode, it is in the general interest for car utilization to be curbed by the existence of good public transportation networks around the different stations. Whence the need to ensure intermodality with other modes in these stations as described in section 4.d and paragraph 4.f.7 but also to provide intercity and commuter services to take the passengers to their nearest high-speed station. From a railroad perspective, it is in the interests of both high speed operators and conventional passenger train operators to develop a concerted approach to the task of deciding on the services to be provided to bring people on to trains.

Such cooperation will give existing railway operators the chance to benefit from the expertise of an experienced global railway operator such as SNCF and consequently to be able to develop their services overall in order to tap into market growth induced by high speed services in full. This shared expertise can be on subjects such as:

- Safety of freight and passenger trains on shared tracks or corridors
- Cohabitation of different type of service in terms of capacity at both railway junctions and on the line
- Requirements for optimum operational management of mixed traffic
- Good coordination of passenger services in stations to achieve maximum synergy between high-speed services and Intercity/commuter services.

It is also necessary, as explained in section 4.o, to remember that the enhancement and modernization of infrastructure will raise the global quality of the network enabling the conventional railway operators to provide better services in term of regularity, comfort and safety.

4.k.2 Other passenger operators

As explained in the previous paragraph, communications and understanding between high speed and conventional operators over services will be mutually beneficial. Nevertheless to achieve true and complete efficiency, common commercial and ticketing approaches are also necessary in order to facilitate access to trains and ensure that travel is considered as a whole and not as the juxtaposition of several separate segments. This type of partnership will lead to client satisfaction and consequently to traffic growth.

SNCF has an extensive experience of these complementarities:

- In France, of course, where SNCF acts as a multimodal operator managing the TGV high-speed network as well as Intercity and commuter trains, in addition to buses, light railroads and subways possibly in partnership or through its own subsidiary Keolis. SNCF is therefore highly experienced in all modern forms of ticketing and multimodal commercial approaches.
- In the UK through Eurostar services where, for example, a number of cross-selling agreements have been negotiated with local railroad companies in order to facilitate travel from inland England towards France and Belgium thereby increasing ridership and market shares for all parties.

4.k.3 Railway Infrastructure

Even if high-speed trains are not operated in association with other forms of traffic when running at full speed (i.e. over 100 mph), their main advantage is to be able to run at lower speed on conventional railroad infrastructure in the approach to terminals, thus for example limiting the impact of right-of-way in urban areas.

It should also be remembered, and this could be an important factor in the success of the project, that existing track may have to be shared in the early phases of the project, at least at the beginning of the high-speed service. Local constraints, financial choices or even the phasing of the construction process because of local difficulties may make mixed operations unavoidable. But they could also be the result of political decisions about the validity of heavy investment in areas where this could be avoided or postponed for as long as the full capacity of the line or station (platforms) has not been reached.

Not all stations served by high-speed trains should be new, in particular in the case of “historical” stations. To facilitate connections between railroad operators for passengers and

organize intermodality in downtown stationx, it is often better to concentrate all the different transportation modes around an existing station.

Given these considerations it is understandable that, at some point, high-speed infrastructure will interface with existing railroad infrastructure. As an operator and as a railway infrastructure manager, SNCF has many years of experience of managing such situations. It can provide a high level service from engineering to planning, track layout and operation phasing and construction management to traffic management during these phases. Its efforts will be fully coordinated with the operators concerned. The main objective will be not to interrupt railroad traffic except for short periods agreed by the railroad operator. The process could be handled as follows:

- Construction of high-speed infrastructure.
- Construction on active ROW not requiring relocation of existing track: all appropriate measures will be taken to avoid the impact on current rail operations. Exceptional work will be planned long in advance and coordinated with the operator concerned.
- Construction on existing railroad right-of-way that affects the existing railroad alignment: SNCF will seek full cooperation with the current operator through joint design development and common working groups. The design and work will comply with all existing US technical railroad requirements (i.e. AREMA rules) and the infrastructure requirements of the current operator.
- Construction work and modifications to existing stations: particular care will be taken not to disrupt existing passenger services to the greatest possible extent. In these public areas the maintenance and protection of public spaces will be managed as a matter of priority.
- Maintenance of Way: Common policy will be developed at an early stage between SNCF and the existing operators in order to develop trackage rights allowing all operators to successfully work their services. Trackage right negotiations will be completed among operators before the commissioning of the high-speed line. In this respect, the low axle load of HST reduces significantly the impact on any infrastructure (Section 4.o).
- Interfaces with the appropriate stakeholders and the relevant highway and roadway agencies as regards grade separation: SNCF will establish a specific organization to take charge of handling discussions, negotiations, design, work schedules and construction management.
- Interface with utilities companies over utility protection and relocation: A similar form of organization will be adopted.

4.1 PROPOSED ROUTES AND ALIGNMENTS

SNCF is proposing to construct, operate and maintain an electric-powered steel-wheel-on-steel rail HST system, capable of operating at speeds of 220 miles per hour (mph) on mostly dedicated, fully grade-separated track, with state-of-the-art safety, signaling and automatic train control systems. The proposed route alignment will be designed to allow operating speeds to be raised to 250 mph at some time in the future. The signaling system proposed is able to manage a theoretical headway of 3'30" between trains.

The proposed route, about 400 miles on first phase, contains eleven stations and connects San Francisco Transbay Terminal to downtown Anaheim, passing through Los Angeles Union Station, Palmdale, Bakersfield, Fresno, Gilroy, and San Jose Diridon. A branch will connect Merced and will be extended in a future phase 2 to Sacramento through Modesto and

Stockton. Another branch will connect also on phase 2, LA Union station to San Diego through Ontario Airport, Riverside, Murrieta and Escondido.

Scoping been well engaged in California, through the EIR/EIS process, SNCF endorses the route proposed by the CHSRA.

A more detailed description with maps is given in Appendices 8 and 9.

4.1.1 Existing Right Of Way (ROW)

The route will, wherever possible, follow existing rail transportation facilities rather than new corridors, reducing potential unplanned growth and unnecessary sprawl in rural and urban areas. Therefore SNCF plans to propose that corridors be shared with existing operators and will develop an intrusion protection plan to mitigate any risk. SNCF knows that a MOU already links Caltrains and the CHSRA concerning the share of the Caltrains corridor and will fully endorse this agreement.

Stations will be spaced approximately 50 miles apart in rural areas and closer together in metropolitan areas to obtain the greatest possible benefits from high-speed travel.

In virtually every major city, the high-speed train station will be developed in conjunction with existing rail transportation hubs to produce the most efficient linkages to local and regional transit systems. Efficient integration of the high-speed train network with local transportation systems is paramount to the success of both.

4.1.2 New Right of Way

Wherever is not possible to share existing railroad ROW due to the refusal of existing operator(s) or the isolated nature of the alignment, SNCF will develop a policy of right-of-way acquisition which will limit property owner impacts and will strive to use existing transportation corridors to contain the environmental effects.

4.m REQUIRED INFRASTRUCTURE INVESTMENTS AND IMPROVEMENTS

SNCF is proposing the construction of ROW suitable for high-speed train operations at speeds up to 220 mph with the possibility of increasing this to 250 mph at a later stage depending on operating and/or commercial needs. Traffic capacity will be sufficient to cater to expected ridership.

SNCF is therefore thinking in terms of a dedicated electrified double track line with top level signaling and traffic control systems for a theoretical headway of 3'30" minimum. This line will be electrified with a 2 x 25 kV AC current. track can be laid either on concrete sleepers and ballast or on concrete slabs. The final decision will be made at the more detailed design stage in the light of site conditions, economic factors and contractor best practices.

Main investments planned:

- Up to date train management system like ERTMS level 2 (or similar) which includes ECTS level 2 (or similar) signaling system plus GSM-R (or similar) radio network. This system will fully meet the PTC control requirements stipulated by RSEA (see section 4.o).
- Electric power will have to be provided through contracts negotiated with the utility companies, and SNCF is intending, as a matter of principle, to negotiate first and foremost with companies providing "green" electricity from renewable energy sources. This electricity will feed the overhead line via power stations spaced out regularly along the line. In these facilities, all the critical functional elements for operation will have built-in redundancy.

- New track alignment will be fully-fenced and grade-separated in relation to intersecting streets, highways and railroads. When shared corridors have to be used along highways or railroads, intrusion protection structures will be designed to mitigate any risks. Box culvert grade separations will be provided at regular intervals and according to necessity to provide crossings for wildlife and access for agriculture purposes.
- In rural areas, the new line will be constructed on new right of way to be acquired from private owners. To limit the impact of the new line, the alignment will as far as possible, be routed along existing highway or railroad corridors. Within these areas the nominal right-of-way width should on average be 100 feet. Additional widths will be required in areas where profile gradients require heavier cuts or fills.
- Within urban areas, SNCF will negotiate the possibility of sharing right-of-way with existing operating railroad companies. On this point, SNCF is fully aware of the concern expressed by the Federal Rail Administration about mixing different types of traffic and will provide full operating solutions to comply with the FRA requirements (Rule of particular applicability for Rolling stock, state of the art train control system, time separation of the various traffics or fully dedicated tracks with intrusion protection). In the case of corridor sharing with an existing railroad, SNCF may propose, if necessary, to upgrade the full corridor in order to increase operating speeds and improve the line capacity. Such investment operations will be fully coordinated and negotiated with the railroad companies on a win-win basis. In such cases, SNCF will be able to provide excellent engineering services thanks to its French and worldwide experience in maintaining and upgrading railroad networks in revenue service with mixed traffic.
- These upgrades of existing railroad corridors could involve track alignment, electrification and even Positive Train Control installation and communications.
- Development of passenger terminals and station facilities in downtowns or adjacent areas located within convenient access of existing freeways, and major streets. Full passenger amenities will be provided at all stations (see paragraph 4.e.2). These locations will be chosen in association with the city departments concerned so the process fits into any plans to revitalize, renew or modernize the area adjacent to the station (see Section 4.d).
- Construction of a rolling stock main maintenance workshop as well as yards for overnight storage, inspection, washing and light repairs to rolling stock close to the stations. Some major areas of land will be necessary to house these facilities.
- Construction of maintenance of way facilities along the line an average of 100 miles apart. The necessary right-of-way for these facilities will need to suffice to provide storage space for materials, track elements, system components, work train stabling as well as offices and staff facilities. The location should be close to an existing freight railroad in order to ship materials in and out by rail.

4.n MITIGATION OF ADVERSE IMPACTS

SNCF is fully aware that the project will have major impact on both environmental and community resources along the route.

It therefore intends to develop a “Mitigation Plan” at the earliest possible stage to offset such impact. Potential mitigation measures will be related, but not limited to:

- Air quality
- Hydrology / water quality /
- water quantity
- Soils and unique geological

- features
- Endangered and threatened species and species of special concern
- Wildlife, habitat and vegetation (other than endangered species)
- Hazardous materials / petroleum product management and spill prevention
- Waste disposal
- Noise, vibration, light, turbulence
- Electric and magnetic fields
- Energy consumption
- Beach and shore protection
- Archeological and historical sites
- Utilities, public services and facilities
- Traffic and transportation
- Land use and zoning
- Permits
- Socio-economics (short term and long term impact)
- Growth management.

SNCF will work in close coordination with all federal, state and local entities in order to identify areas of concern and to choose planning and design approaches to minimize negative impact. SNCF can offer the necessary strengths in the various areas where impact mitigation is required in addition to its vast experience of major rail projects around the world, both new and old.

More themes of environment protection are developed in Appendix 2

4.0 TYPE AND QUANTITY OF TRAIN EQUIPMENT

As mentioned in section 4.e, the basic train configuration is a 200 m long trainset with about 500 to 550 seats (1,000 seats per double unit train) and existing rolling stock has been used for simulation purposes.

In the absence of current American standards for HSR, the underlying concept is based on the Technical Specifications for Interoperability (TSI) for High Speed Rolling Stock, which will be adapted where necessary to allow for the standards applicable in the USA.

When drawing up the technical specifications for HRS, SNCF will recommend technical concepts that have shown their robustness in high-speed operations in France and other countries.

It will, for example, recommend:

- Articulated fixed consist trainsets
- With long wheel-base (close to 10 ft) trucks to guarantee a high level of safety, maximum comfort and help reduce energy consumption
- On-board electrical and technical equipment based on the most recent generations of high-speed train
- Signaling system based on ERTMS combining avant-garde technology with reliability.

By contrast, the interior fittings will be innovative and designed to meet the specific needs of regional or local customers.

SNCF can boast substantial experience in the design of the interior fittings of its different generations of high-speed train, both for new stock and for the refurbishment of existing vehicles.

Environmental protection issues are developed more fully in Appendix 2.

4.o.1 Maximum speed

The maximum operating speed on the high speed line will be 220mph which is now the benchmark for most high speed railway projects in the world.

4.o.2 Passenger amenities - service on board

Trains will be designed to high sound-proofing and ambient temperature standards for passenger comfort, for instance in accordance with the TSI HS RS. (Technical Specifications for the Interoperability of High Speed Rolling Stock).

Market research will help determine the appropriate number of different classes on-board, as well as the bar/dining car, galleys and specific elements such as meeting rooms for business travelers, entertainment/travelers information system.

All seats are individual and pitched according to foreseeable development in passenger size. The on-board experience (combining both the “hard” and “soft” service factors) plays a major part in consumer satisfaction: train design must form a solid foundation for excellent service. In this respect, each passenger will have for instance a separate reclining seat with its own reading lamp. Power sockets will be available at all seats, as well as USB sockets (or a future standard), each coach will have a passenger information facility Internet or cell phone connections.

Lastly, trains should be modular in nature in order to easily incorporate new services and accommodate new needs that will emerge in the 30 years in which they will be in operation. This will also make it possible to offer regularly renewed, cutting-edge interior design, working in partnership with the best designers to create an exceptional moment on board.

4.o.3 Energy consumption profile

The train's power consumption will depend on the operating conditions (type of service, weather conditions). Appendix 10 gives some examples of the amount of power required for a variety of operating conditions.

4.o.4 Acceleration and deceleration rates

Trains on high speed lines accelerate at a rate of 0.546 Yd (1.638 feet)/s², in accordance with the TSI HS RS standard.

The train decelerates at a rate from 0.92 Yd (2.76 feet)/s² at 200 mph to 1.3 Yd (3.9 feet)/s² at 100mph, depending on the increments, in accordance with the TSI HS RS standard.

4.o.5 Service development plan, fleet and phasing

Three stages have been assessed to provide an efficient business case from Day 1 up to the targeted full service.

- The first stage is expected to be implemented at the end of 2017 in order to start commercial operations in early 2018. 12 of 25 units need to be purchased before the start of operations so they can be tested and commissioned before the handover of the section of line and, depending on fleet reliability, it is recommended to buy new units as soon as possible. Between 2018 and 2020 13 of 25 units need to be purchased to operate 64 daily services calling all stations (31 SF Transbay to Fresno and 31 SF Transbay to Merced on the 194 mile section from San Francisco Transbay to Fresno and the 18 miles branch to Merced. Single unit consists will be

operated on an hourly basis during the whole day with a fleet assessed at 21 diagrammed units (or hot spare) and four out of service for maintenance purposes.

- The second phase is scheduled to start in early 2021 after the implementation of the full infrastructure with following clockface daily services:
- 34 services between Transbay and Merced
- 34 services between Merced and Anaheim
- 42 services San Francisco Transbay – Los Angeles Union with two intermediate stops
- 60 San Francisco Airport – Anaheim calling at most of the stations a

Services are planned to begin with single unit trains on all services, with frequency being stepped up as demand rises and double-unit trains coming into force to replace the first consists.

Train fleet will be increased by 145 units to reach a 170 unit fleet end 2023 (155 diagrammed or hot spare and 15 units in maintenance). 70 additional units are required in early 2021 to start the new service and the other units will be delivered over three years.

- The final phase is planned to start early 2024 with following daily services:
 - 34 services between Transbay and Merced
 - 34 services between Merced and Anaheim
 - 62 services between SF Transbay and LA Union with two intermediate stops
 - 100 services between SFO Airport and Anaheim calling (alternatively) at all stations.

Clockface services will continue to increase and only double-unit consists will come into force to replace single units during the period. The train fleet will be increased consequently by 68 units to reach a 238 unit fleet filling the reference operation plan (218 diagrammed or hot spare and 20 units in maintenance).

4.p PROJECT CAPITAL COSTS

Capital costs have been calculated on the basis of comparable projects in the USA or abroad. SNCF has used its knowledge of high-speed systems worldwide to minimize the level of cost uncertainty. The accuracy of the cost estimations reflects the preliminary nature of the current study.

4.p.1 Major categories of expenditure

Capital costs include all aspects of the initial investment in the project, including:

- Professional fees
- Construction costs (including stations and depots)
- Rolling stock purchase
- Land acquisition

NB: SNCF has included neither client fees nor possession fees within the capital costs.

4.p.2 Methodology and assumptions

Capital costs were broken down into the following items:

Professional fees

This item includes project management and design fees.

Land acquisition and compensation

This item includes acquisition of land to secure property titles for the route right-of-way itself, and also for stations, electrical sub-stations, maintenance of way facilities, train storage yards and rolling stock maintenance facilities.

It also allows for the cost of acquiring and demolishing buildings, and the cost of any land use displacements.

Infrastructure

This item includes the required construction work which encompasses right of way preparation and construction of viaducts, tunnels and bridges; the cost of work-sites is included.

Costs have been differentiated according to infrastructure type as follows:

- At grade alignment:

Categorized according to topography:

Easy terrain: flat to slightly hilly terrain, little necessary earthworks.

Difficult terrain: extensive earthwork necessary to compensate for uneven terrain.

Urban areas: a specific cost for urban areas was considered when tunneling could be avoided

Shared areas: specific costs for shared areas with existing transportation infrastructure (particularly railroads and highways) were also considered to compensate for complicated construction and intrusion protection facilities.

- Viaducts and exceptional structures
- Tunnels

In general, high speed alignments are designed to allow for speeds of 250 mph. However, some sections are designed for lower speeds in order to avoid excessive cost. In urban areas, speed of 125 mph is often considered to limit the different impacts.

System

This item includes the required rail system equipment, which broadly consists of the permanent way, signaling, telecommunications, power supply, overhead line equipment, etc.

The cost has been differentiated according to sub-system type as follows:

- Track.
- High Voltage Power Supply
- Overhead Catenary
- Signaling (ECTS Level 2 or equivalent or superior)
- Cables
- Telecommunications (GSMR – voice and data communication).

Workshops and small depots

The design and construction costs of HS workshops and small depots will depend on the size of the rolling stock fleet, and the number of locations required.

Maintenance Bases

The design and construction costs of HS maintenance bases will depend on the line length, size of the rolling stock fleet, and the number of locations required.

Stations

This item includes construction of new stations and renovation or extension of existing ones.

- Capital costs were next broken down into high-speed route segments to simplify compilation while developing phasing proposals. These capital costs per segment were calculated by applying unit costs (per foot or mile, for example) to the

alignment of the segment. Some capital cost items were calculated as percentages of other costs. All costs were calculated on the basis of 2009 economic conditions.

4.p.3 Rolling Stock costs

The purchase cost of rolling stock per trainset was determined on the basis of current market rates. For the number of trainsets indicated above, the corresponding capital costs are given in the following table:

Figure 19 – Fleet (Rolling Stock)

Acquisition periods	Nb of Units	MUSD 2009
2010 - 2017	12	465
2018-2020	13	504
2021-2024	145	7,478
2025-2050	68	775
Total Fleet	238	9,221

4.p.4 Capital costs summary

The construction cost (excluding land and including formation, track, sidings and yards, signaling and telecommunications, stations, workshops and other buildings) is estimated to be about **USD 26.5 billion** in \$ 2009 and the value of the land required to be about **USD 1.9 billion** in \$ 2009.

The cost of the rolling stock is estimated to be about **USD 9.2 billion** in \$ 2009 of which **USD 8.4 billion** will be needed for the initial operation of the railway (2018-2025), with further rolling stock costing **USD 0.8 billion** required to meet the forecast traffic growth (2026-2050).

Figure 20 – Initial Capital Costs)

	MUSD 2009	%
Land Acquisition	1,887	5%
Infrastructure	19,951	53%
Formation at grade	12,587	33%
Viaduct	3,418	9%
Tunnel	3,946	10%
System	4,481	12%
Track	1,107	3%
Power Supply	407	1%
Catenary	650	2%
Signaling	732	2%
Cables	163	0%
Telecom	569	2%
Infra Maintenance Depot	854	2%
Stations and Buildings	1,234	3%
Stations and Buildings	965	3%
Access to Infrastructure	269	1%
Rolling Stock	10,077	27%
Rolling Stock - HST 220 mph	9,221	25%
Rolling stock workshop Depot	855	2%
Total Capex	37,629	100%

4.q DETAILED ANALYSIS OF THE METHODS AND TECHNOLOGIES ACCORDING TO TRIP TIMES AND RELIABILITY STANDARDS

The methodology and the findings of economic, technical, operating and financial studies are described. The next stage is to explain how the service will be provided, in other words how the contract with the authorities sponsoring the project will be fulfilled.

- The technical options recommended are both proven and robust (e.g. track equipment, electric power supplier facilities, rolling stock design, etc.). Moreover SNCF has the habit of demanding systematic robustness studies (AREMA)
- The "systemic" analysis of potential risks enables events to be managed immediately they occur
- The methods guaranteeing that the product will be properly produced also extend to the organization of the test phase. SNCF will have to adapt these procedures to US rules, as it has already done in many other countries
- Preparations to commence operations are highly dependent on the personnel training plan and on "dry" runs before the start of revenue service. Tests will also need to be carried out with customers in different operating situations in order to ensure total safety
- One of the key factors in achieving reliability (and operating safety) is the organization of the OCC referred to in Section 4.o

By way of illustration and as a benchmark based on SNCF experience, HSR services should, in operation, achieve results similar to those obtained by the most efficient networks, namely zero fatal accidents due to technical or human error and mean annual RS availability rates of 80 percent in off-peak and up 98 percent in peak periods, as shown in RS Appendix 10 for trainsets each covering 250,000 miles per year.



To facilitate maintenance the trainset should be able to automatically transfer data on the status of its equipment to the OCC in real time. The result should be more preventive maintenance and less remedial repairs.

Where financial results are concerned, the reliability of the methods used for forecasts and business case analyses are borne out by the accuracy of the forecasts in relation to actual results for a few recent or older SNCF projects.

4.r SYNOPSIS AND REFERENCES FOR ANY PAST HSR RELEVANT STUDIES

California first explored the possibility of a high-speed line linking the State's major cities in the eighties. In 1984, SYSTRA, the international consulting group of SNCF, carried out preliminary studies on the Los Angeles-Las Vegas (360 km) and Los Angeles-San Francisco (600 km) routes.

The California High Speed Rail Authority (CHSRA) chose the consortium headed by Parsons Brinkerhoff (PB) as program management team in December 2006. SYSTRA, one of PB's partners, then went on to provide the full range of its expertise in the field of high-speed rail. Preliminary studies carried out so far have helped to define the specifications of the project.

The California project being already organized around the CHSRA, all and useful documentation can be reached via the authority web site: <http://www.cahighspeedrail.ca.gov/> .

5 FINANCIAL PLAN

The main macro-economic assumptions used in the financial projection are the following:

- Revenues have been calculated in USD 2009 and with regard to the following two assumptions:
 - Deduction of Value Added Tax (VAT) at a constant rate estimated on average at 8%⁴;
 - Their indexation on the Gross Domestic Product (GDP) growth rate. Passenger revenues are expected to keep on rising by an average of 2.5% per year from 2018 (start of operation) to 2050.
- Capital costs and operating and maintenance expenditures have been calculated in 2009 USD and indexed to inflation estimated at 2.5% per year (2010-2050)
- Corporate tax has been estimated at 30%.

5.a PROJECTED ANNUAL OPERATING FAREBOX REVENUES

Annual passenger traffic forecast and operating revenues (based on commercial ticket fare and other revenues generated by the project) over the project period (2018-2050) are given in paragraph 4.g.2 et 4.g.3.

Passenger farebox revenues that are generated by the Project over the operating period (2018-2050) are estimated at **USD 68.5 billion** in 2009 dollars (without VAT) equivalent to **USD 138.2 billion** in current value (without VAT).

Expected annual operating revenues by year are provided in Appendix 12.

5.b ESTIMATED ANNUAL OPERATING COSTS BY TYPE OF EXPENDITURE

The operation and maintenance expenditures that are generated by the Project over the operating period (2018-2050) are estimated at **USD 29.6 billion** in \$ 2009, i.e. **USD 57.7 billion** in current value (see 4.h.3).

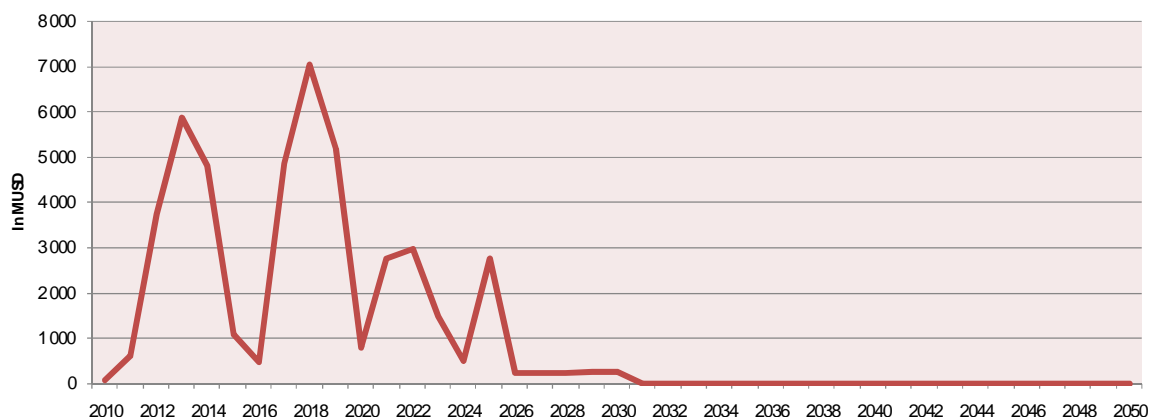
Expected annual operation and maintenance costs by year are provided in Appendix 12.

5.c ANNUAL SCHEDULE OF CAPITAL COSTS

The total initial capital costs required is **USD 37.6 billion** in 2009 dollars, equivalent to **USD 46.4 billion** in current value including inflation. Further capital injections of **USD 8.5 billion** in current dollars would be required for renewals over the project life. Over the whole life cycle of the project, the total capital required is **USD 54.8 billion** in current dollars. Note that, at this stage, only the initial capital costs for Infrastructure, System, Stations and Buildings have been taken into account in the base case cash flow financial analysis.

⁴ According to information available on the American Institute of Certified Public Accountants website

Figure 21 – Initial capital expenditures



Expected capital costs by year are provided in Appendix 12.

5.d SOURCES AND DESCRIPTIONS OF CAPITAL FUNDS

Financing the project will of course imply the contribution of significant capital funds. Sources of such equity are various, including among others public stakeholders (from the federal level to the local level) and private sector involved in the project (industrial parties as well as financial ones specialized in project finance).

The final split among the parties of the required capital funds will depend on various factors, such as:

- The internal financial profitability of the project, from which the capacity to remunerate the equity invested at market conditions will be derived,
- The legal and financial structuring chosen for the project,
- The risk allocation among the parties,

As regards this RFEI, at this early stage, SNCF has just made broad assumptions on the structuring and the financing (see 5.j below), for purely illustrative purposes.

SNCF would be pleased to go further into financial analysis and engineering with the concerned Authorities, to establish the most convenient process to succeed with further stakeholders, based on its extensive and successful experience. Indeed, through past and current projects driven by SNCF, the Group has proven its ability to determine the best financial sources suited to specific projects, and to take a significant part as the case may be: full financing by SNCF, split between SNCF and national authorities, but also local authorities and industrial partners.

SNCF is willing to share its knowledge in financial structuring of projects, which make sense on a socioeconomic basis such as the one presently considered, and in particular in gathering required funds by involving all the stakeholders at the federal and local levels.

- More details on SNCF's views are given in Chapter 9.

5.e CREDIT ASSUMPTIONS

Depending on the financial profitability of the project, the partners could leverage the project's financing by raising debt.

The possibility to raise debt will depend on various factors, such as:

- Availability of liquidity at fair market conditions

- Borrowing power of the project and/or of the special purpose vehicle that would subscribe to the debt
- Risk profile of the project and/or of the special purpose vehicle that would subscribe to the debt
- Guarantees/securities, in particular from public authorities.

As previously stated, SNCF has just made broad assumptions on the structuring and the financing (see 5.j below), for purely illustrative purposes. SNCF would be pleased to go further into financial engineering with the concerned parties to work on those issues.

5.f INSURANCE PROGRAM FOR CONSTRUCTION AND OPERATION

The control of the risks inherent to the delivery and operation of a HSR system is critical to the various parties involved, private sector parties and the public body to which they are accountable. Focus should be put on the assessment and neutralization of risks and exposures through a combination of risk transfer and risk financing techniques. The appointment of a national and international leader in the brokerage field is the first step to achieve this.

During these challenging financial times for the insurance market, SNCF can benefit from its excellent credit rating that gives it access to favorable terms and conditions on the market. Depending on the procurement method identified to deliver the project (P3) or Design & Build, there exist a large number of products available on the market to optimize protection.

If the project is delivered as a P3, SNCF has in the past identified the value of the Controlled Insurance Program (“CIP”). The CIP is a centralized insurance program under which one party procures insurance on behalf of all parties (the HSR Authority, the members of the Consortium, such as the designer, the contractor, the O&M contractor) performing work on a project or a site. Typically, the coverage provided under a CIP includes builder's risk, commercial general liability, worker compensation, and umbrella liability. CIPs offer a number of benefits including greater control of the coverage, potentially lower costs and reduced litigation.

The Program consists of the following coverage:

- Workers' compensation
- Employers' liability
- Commercial General Liability
- Business Automobile Liability (if necessary)
- Professional Liability
- Property Insurance

Builder Risk Insurance

Property in Operation

Contractors' equipment

Business Interruption

If the O&M contract is awarded separately from the Design & Construction, each entity responsible will have to implement its own coverage specific to its particular fields.

5.g CONSTRUCTION COST RISK SHARING AND RATIONALE FOR THE PROPOSED APPROACH

One of the key structuring criteria of the project will be risk sharing among the various stakeholders. The general principle is that the allocation of risks depends on the ability of each party to manage them: transferring a risk to the best suited to assume it is the way to optimize the successful completion of the project and the control of its costs.

As regards the specific construction cost risks, SNCF has proven its ability to manage them, including in relation with subcontractors and partners, during past and current high speed rail projects.

In the context of this RFEI, the risk sharing will depend on the final structuring of the project chosen by the Authorities and project sponsors, and the public and private partners that SNCF may have in developing further the project.

At all events, SNCF believes that its involvement as a key partner in developing the project will be a major asset in significantly reducing the risks, given its high level technical and managerial expertise.

5.h REVENUE AND OPERATING COST RISK SHARING AND RATIONALE FOR THE PROPOSED APPROACH

As regards the specific revenue and operating cost risk, SNCF has been managing such risks daily for nearly 30 years by operating HSR in France and in Europe. In consequence, it has developed, and is improving daily, its knowledge, methods and tools to optimize the management of all operating and financial risks as far as high speed train operations are concerned. In the context of this RFEI, the risk sharing will depend on the final structuring of the project chosen, and the public and private partners that SNCF may have in further developing the project. At all events, SNCF believes that its involvement will be a major asset in significantly reducing the operating risks, in terms of revenues as well as operating costs, given its high level technical and managerial expertise.

5.i PROJECTED FUNDING FOR THE FULL FAIR MARKET COMPENSATION FOR ANY ASSET

The estimations of capital costs as shown in section 5.c. include provisions for such compensations. At this very early stage, SNCF has made broad estimations, based on its extensive experience. Still, further analyses may reveal sensitive situations that could require higher provisions.

5.j PROJECTED FINANCIAL STATEMENT

5.j.1 Financial analysis methodology and project modeling

In a financial analysis, all the elements that influence the costs, revenues and returns from the project are of interest when determining the finance structure and assessing the financial requirements to be reached by the corporate company. The results of such analysis can be used to determine whether a project is sound enough to pursue, by:

- Giving an initial figure for project internal rate of return (IRR);
- Establishing a finance structure that is sustainable by the project;
- Assuring lenders and investors of the attractiveness of the project.

A comprehensive computer financial model for the project was constructed in order to derive:

- Operating revenues and expenditures for each year of the project life (2018-2050)
- Operating surplus for each year (i.e. Earnings Before Interest, Tax, Depreciation and Amortization or EBITDA), and net income after provision for renewal of assets (EBIT).
- When relevant, the financial internal rate of return (IRR) over the project life, i.e. that interest rate at which the aggregate discounted cash-flow equals zero.

5.j.2 Overall financials of the project

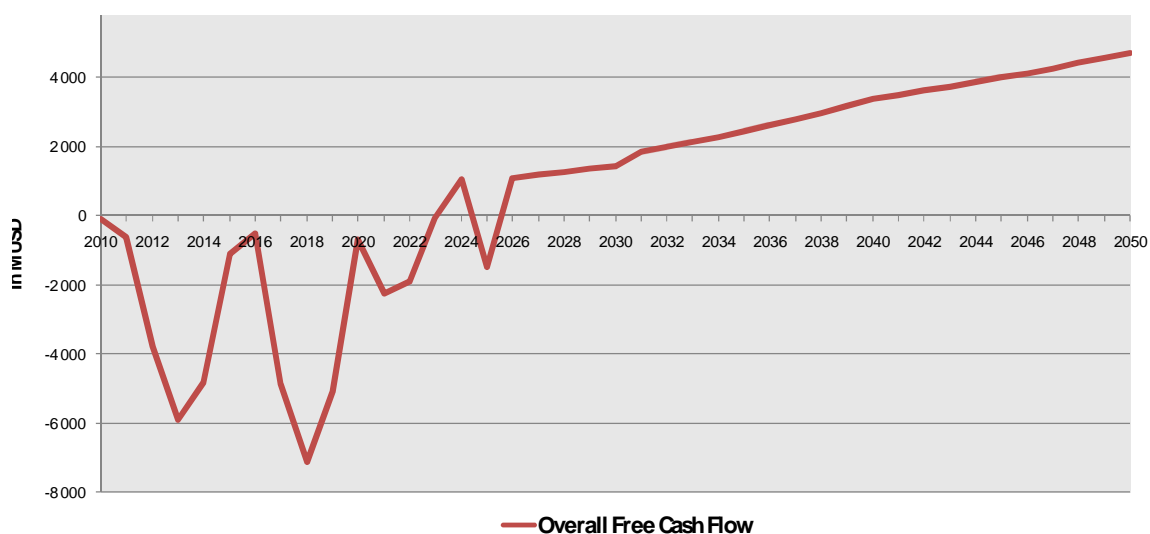
The table below shows the cash-flow for the California HSR 220. Note that results are available for each year of the project but only selected years are shown below for illustrative purposes. All figures are in current values million USD.

Figure 22 – Overall Financials - California HSR

	2018	2022	2030	2040	2050	Total (current)
Revenues	102	2,083	3,639	5,504	7,046	138,207
Operating Costs	78	548	1,075	1,183	1,302	32,330
Maintenance Costs	89	435	841	926	1,019	25,404
EBITDA	-65	1,099	1,723	3,395	4,725	80,472
Infrastructure depreciation	242	479	479	479	479	15,105
Rolling Stock depreciation	40	232	431	431	431	12,143
EBIT	-348	388	812	2,485	3,815	53,224
Capital costs for Infrastructures	6,421	0	0	0	0	33,419
Capital costs Rolling Stock	629	2,991	260	0	0	12,932

The operation is expected to generate a positive EBITDA after one year of operation (2019). The project EBIT is also positive from 2022 to 2050. Expected EBITDA and EBIT by year are provided in Appendix 12.

Figure 23 – Overall free cash flow (in MUSD –current value)



The positive EBITDA described above provides a great opportunity to pursue the project which could attract investors and lenders. In this context, SNCF has looked at ways of establishing a finance structure that is sustainable by the project.

5.j.3 SNCF Financial Approach

Only a detailed legal, technical and financial feasibility study in close cooperation with the US DOT suffices to exhaust all arguments and assumptions against or in favor of one financial structuring option versus another.

All the following results must be appreciated in the light of the assumptions mentioned and should be interpreted as a proposed approach and methodology for analyzing the way Private Sector Participation could be involved in the California HSR.

Our view, to be confirmed by further detailed studies should this initiative be pursued, would be that part of the project could be developed by a special purpose vehicle designated further as **Special Purpose Company**, in charge of (i) operating commercially the California HSR and (ii) financing some of the initial capital costs.

Recommended option

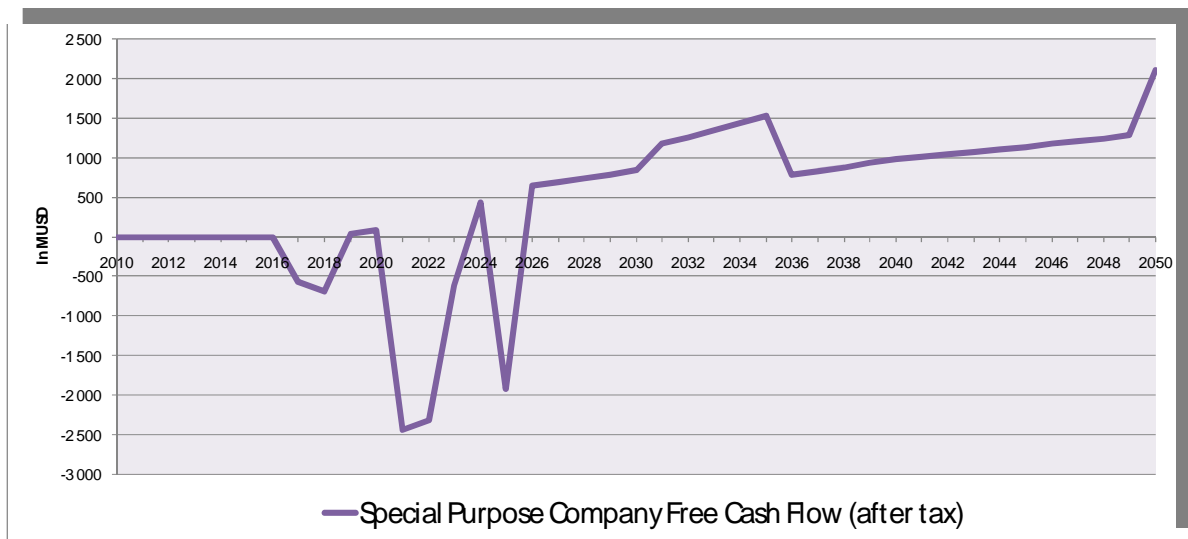
If US Public Authorities (either Federal, State or Local) finance the initial capital costs for Land, Infrastructures, System, Stations and Buildings, i.e. USD 28.4 billion in \$ 2009 (USD 33.4 billion in current value), the Special Purpose Company, which could include SNCF, could then finance its own Rolling Stock, i.e. USD 9.2 billion in USD 2009 (USD 12.9 billion in current value) and the level of earnings should be sufficient to enable the Special Purpose Company to (i) still be commercially viable and (ii) return to the US Public Authorities a Contributory Capacity under terms and conditions to be determined (access charges, renting, renewal of assets, etc.).

Figure 24 – S PC Financials - California HSR

	2018	2022	2030	2040	2050	Total
Revenues	102	2,083	3,639	5,504	7,046	138,207
Operating Costs	78	548	1,075	1,183	1,302	32,330
Maintenance Costs	89	435	841	926	1,019	25,404
Contributory Capacity	0	242	327	2,173	3,024	40,648
EBITDA	-65	857	1,395	1,222	1,701	39,824
Rolling Stock depreciation	40	232	431	431	431	12,143
EBIT	-105	626	964	791	1,270	27,681
Capital costs Rolling Stock	629	2,991	260	0	0	12,932
SPC Internal Rate of Return (After Tax)						8.2%

The total Contributory Capacity available from the Special Purpose Company would reach about **USD 40.6 billion** in current value over the project life-cycle. This Contributory Capacity could also enable US Public Authorities to recover some part of their initial disbursement.

Figure 25 – Special Purpose Company Free Cash-Flow



As shown below, in this case, 43% of funds required for the initial capital investments including rolling stock (in present value discounted at 4%) would be generated from operating revenues.

Figure 26 – California HSR funding option

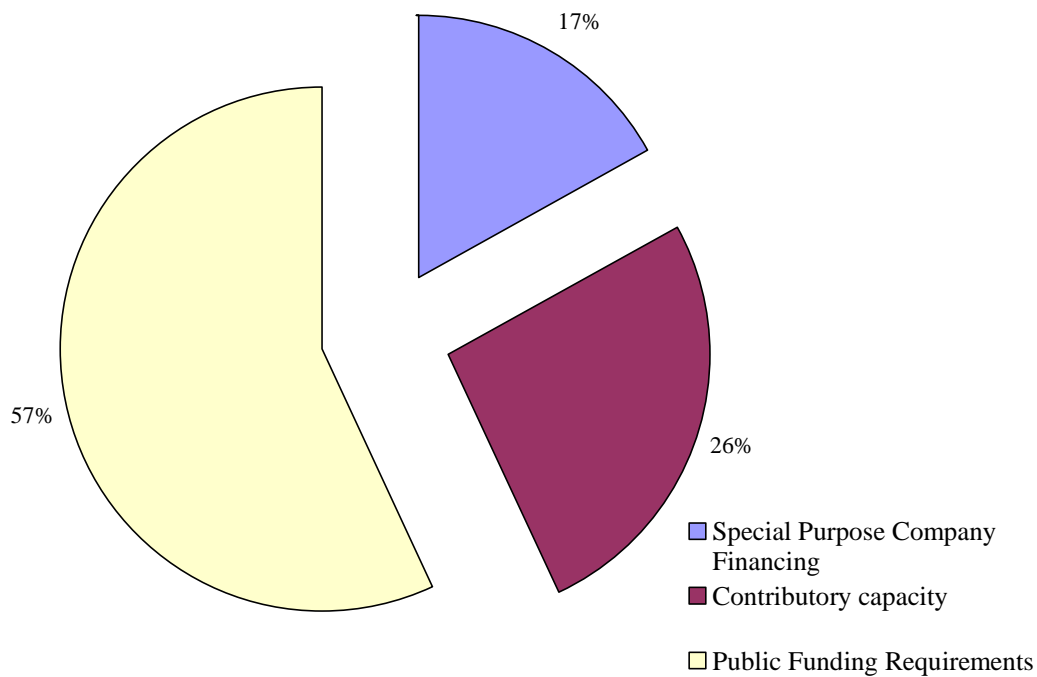


Figure 27 – California SPC Financing Plan (2010-2050)

Proposed Private Financial Structuring	
SPC (Group SNCF) scope	O&M activities Rolling Stock Financing
Debt Structuring Assumptions	80%
<i>Start of Debt Repayment</i>	+ 2 years after RS Acquisition
<i>Interest Rate</i>	6%
<i>Maturity</i>	15 years
Equity Structuring assumptions	20%
<i>Cost of Equity</i>	13%
<i>Risk-Free Rate</i>	4%
<i>Country Risk Premium</i>	1%
<i>Market Risk Premium</i>	4%
<i>Beta</i>	0,9
<i>Equity Risk Premium</i>	4%
Dividends Distribution Policy	100%
Contributory capacity (% EBITDA)	
<i>2017 - 2025</i>	22%
<i>2025 - 2035</i>	19%
<i>2035 - 2050</i>	64%
Income tax rate	30%

Figure 28 – California SPC Financing Plan (2010-2050)

SPC Financing Plan (in MUSD - current value)			
Uses		Sources	
Initial Capex	12,932	Investment Public Subsidy	0
Initial Financing Needs	160	Equity	2,746
		Debt	10,345
Total	13,092	Total	13,092

With regard to its financial equilibrium constraints, such option would allow the Special Purpose Company to achieve a minimum Annual Debt Service Cover Ratio (“**ADSCR**”) of **1.1 in 2036**, in line with internationally acceptable practices.

The SPC's capacity to contribute to the financing of some part of the total California HSR costs has also been assessed with regard to its financial return requirements.

The overall financial viability of the project for the SPC investors has been measured through financial return indicators:

- Special Purpose Company Internal Rate of Return (IRR) after tax would be equal to **8.2%**
- SPC shareholders Return on Equity (ROE) would be equal to **13.0%**

P&L Statement and Cash-Flow Statement Sheet of the Special Purpose Company (given by year from 2010 to 2050) are provided in Appendix 13.

In present value discounted at 4%, the benefits of the project for the public at large, quantified in paragraph 4i3, would represent in USD 2009 290 % of the necessary public investment. They would exceed public expenditures in year 2029.

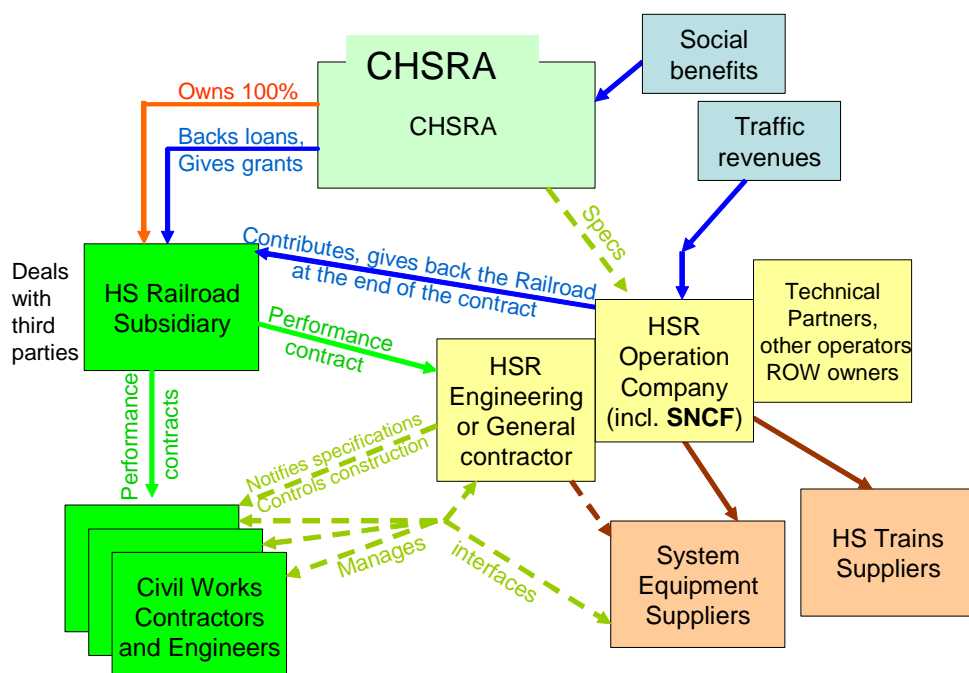
6 INSTITUTIONAL FRAMEWORK AND OTHER INSTITUTIONAL ISSUES

6.a PROJECT STRUCTURE ORGANIZATION CHART - RELATIONSHIPS AMONG THE ENTITIES

6.a.1 Project structure organization chart

It is vitally important to establish the right organizational structures so that all those involved can take their responsibilities as appropriate, and any risks can be managed by the party best placed to do so. The diagram given below shows a typical HSR construction and operation project organization structure. This diagram shows two distinct areas of activity: the construction process, and the operation process. In this diagram, the "operating company" is responsible for rolling stock acquisition. The success of the project will depend to a large extent on proper management of the interfaces between the construction engineer and the future operator, and this will require the closest possible integration.

Figure 29 – HSR Public/Private Partnership Structure



6.a.2 Relationships between the parties involved

- The Authority (dedicated agency or CHSRA) is responsible for the project and will control its development. It will bear the public effort for the project (grants, backed loans, franchises, ...), and “receive” the social benefits
- CHSRA would normally set up a subsidiary company (HSR Subsidiary Company) who would be the owner of the assets. This entity will manage the program, deal

- with third parties, and, in our example, pay the contractors. It may be helped by a program manager. Contractors would preferably have large packages for design and build performance contracts, to accept more responsibility
- The “Delivery Partner” (HSR Engineering or General Contractor) is engaged by the Authority in charge of the project (or an ad hoc property entity) via a performance contract, covering for instance: design, procurement, work supervision, reception, testing and commissioning. It will manage the interfaces between contractors, including system suppliers, and with the future operator who must be involved in the early phase of design
 - The HSR Operating Company which collects farebox (traffic) revenues, operates the High Speed Rail services, and, in return, contributes to project funding in a manner to be agreed (access charges, rent, participation in renewals, etc.).

6.b NEW ENTITIES REQUIRED AND HOW THEY WILL BE STRUCTURED LEGALLY AND FINANCIALLY

The main entities are quoted in § 6.a above. Their structure will depend on their scope of responsibility, and risk profile.

SNCF recommends that close links be established between the Delivery Partner, the Operating Company, and some other stakeholders such as other transport operators and ROW owners. In California, partners we would expect to coordinate with in varying degrees of frequency include Amtrak, SunRail commuter rail operators, CHSRA as the highway right-of-way owner, and the freight railroads.

6.c INTEGRATION OF THE PROPOSED SERVICE WITH OTHER SERVICES AND SYSTEMS

Connectivity between high-speed passenger rail and the existing passenger railway network has the potential to spur the development of HSR in the United States. In France, single rail trips frequently include segments of travel on designated high-speed rights-of-way *and* on conventional track that are often shared with other rail operators (e.g. Freight). For instance, a typical trip might leave Paris following a designated high-speed line and then “jump” over to the traditional network to reach a smaller city. This is one trip – not a series of connections – that utilizes the same rolling stock over the entire course of the trip.

Compatibility between these forms of rail travel has allowed the benefits of HSR to be felt by travelers going between major cities connected by high-speed lines and also by those travelers leaving the high-speed grid. Compatibility between high-speed and traditional lines has enabled gradual infrastructure upgrades to take place without limiting service options. In some cases, this feature has also enabled SNCF to avoid the excessive costs of constructing new rights-of-way in urban areas to reach city centers. In short, SNCF has had great success with its connectivity model.

6.d FEASIBILITY OF GAINING ACCESS TO REQUIRED ROW

We propose three basic options for obtaining the required right-of-way for SNCF use:

- The first is to acquire access rights to the freight or highway right-of-way from the owner for the purposes of using the property for passenger rail operations. Negotiations would be facilitated by the California Authorities (CHSRA) or California High Speed Authority) which has already begun discussions with freight rail right-of-way owners at the time of the previous project some years ago. We

expect that these negotiations will continue to a successful conclusion. We will also work with the California Department of Transportation for the use of highway rights-of-way. The use of active freight railroad rights-of-way for high-speed passenger operations requires that the freight operations, existing and planned in the future, are not impacted. Freight operators, who own much of the ROW needed for high-speed rail, are reluctant to dispose of property or permit lease and/or operating agreements on their property, should it in any way impact or inhibit current or future freight operations or development. The specific nature of access to the property - access fees, duration of the contract, nature of construction, number of trains, scheduling of trains, provisions for right-of-way maintenance, and liability - will be considered for each segment of freight right-of-way. This option could be expeditious, as long as the freight rail owner's conditions are met, which SNCF is prepared to do. Since SNCF tracks are proposed to be isolated from freight tracks, concerns about mixed operations and joint dispatching are avoided. In addition, in many segments SNCF's proposed scope of construction will result in betterments to freight operations.

- In some instances a second option for gaining use of property is needed, principally where new right-of-way is to be established, either as a new route or widening an existing right-of-way. In this option the purchase of the property outright from the individual property owners is needed. If the property owners are willing to sell, this would be a preferred option. The right-of-way needed to the extent feasible will allow the use of the property to continue without impact. Typically property owners will at first not be willing to sell the property. In addition, a purchase agreement would need to be negotiated with each individual property owner, usually a lengthy process that needs to be started in the early phases of design. We will partner with CHSRA or another agency with property acquisition powers for the acquisition of right-of-way using private property,
- A third option that would be used if the second option proves unsuccessful is for a government entity – CHSRA, CalTrans or another agency, to "take" the property for the purposes of public use with the State of California's power of eminent domain. This would essentially be a forced sale of the property. State government agencies with eminent domain powers have the right to force the owners of private property to sell their property if it is needed for a public use, and must do so with appropriate compensation for the property itself, and buildings, the loss of use of the property and relocation costs. In this option, SNCF will rely on the government entity for the acquisition of right-of-way.

6.e REQUIRED GOVERNMENTAL ACTIONS AND APPROVALS AND ROLE OF THE STATE GOVERNMENT(S)

6.e.1 Required Government actions & approvals

High-speed rail networks are expensive, long-term, and complex undertakings; active government oversight and intervention will be necessary at all stages of development. Some of the most pressing institutional issues facing the development of HSR in the United States are financing HSR, setting equipment standards, the role of Amtrak, and streamlining the environmental review process.

Financing

The federal government took a major step towards the creation of a U.S. high-speed rail system by allocating \$8 billion to HSR under the American Recovery and Reinvestment Act of 2008 (ARRA) and the appropriation of \$1 billion in annual funds for five years. Regardless, the development of HSR in the United States will require a more significant “down payment” and annual appropriations by the federal government. See sections 7 & 9 for further discussion of this issue.

Equipment

The Federal Railroad Administration (FRA) will need to work closely with the states to develop regulations to standardize technology requirements across multiple HSR systems. FRA should review the rolling stock currently available on the international marketplace, assessing its compliance under existing U.S. law (taking into account relevant technical and safety regulations). Equipment requirements should be standardized to allow interoperability between systems and to increase competition between rolling stock manufacturers. See section 8(b) for further discussion of this issue.

Amtrak

Amtrak has been the nation’s sole intercity passenger rail service since 1981 and it will continue to play a role in the United States’ transportation network. While Amtrak has seen ridership gains in recent years – and benefitted from continued support from the federal government – Amtrak may need help regarding the resources and institutional expertise necessary to operate “express” HSR. Amtrak’s intercity passenger rail will be an important means of establishing interconnectivity between traditional and high-speed services; however, it does not appear that Amtrak should provide both high-speed and traditional services.

NEPA

The National Environmental Protection Act (NEPA) process is critical to eligibility for HSIPR Program Tracks 1 and 2 grant funding. Because the NEPA process requires federal agencies to review and certify proposed HSR plans before they can be “shovel ready” (a costly and time-consuming process), worthy projects may be overlooked for HSIPR Program funding because of this consuming regulatory process. See section 8(c) for an in-depth response to this issue.

6.e.2 Role of State Governments in Implementing Proposal

State governments (including regional interstate partnerships) will be the strategic partners primarily responsible for designing, building, and operating HSR. Among their many other duties, state applicants will designate HSR service routes, provide operating costs for new or expanded corridor services, procure required goods and services, and garner local political and community support for HSR. Yet, as President Obama’s *Vision for High-Speed Rail in America* recognizes, states have had little time to prepare for an intercity passenger rail program of this magnitude and most lack the resources and expertise to absorb high-levels of HSIPR funding. States will require continued support and guidance from the federal government and industry experts during the HSIPR Program implementation process.

6.f RELATIONSHIP TO STATE RAIL PLANS AND PROGRAMS

Private equity can play an important role. The planning, design and construction of high-speed rail will depend on three sources of funding: state and local, federal and P3. The



commitment of state and federal dollars will represent the majority of the funds but, once they are committed, private equity should be attracted to these projects - perhaps for as much as one quarter of the cost of the initial investment. Private equity can include investment, project debt financing, vendor financing, systems operation and private ownership opportunities.

The California 2007-2008 to 2017-2018 State Rail Plan, prepared by the California Department of Transportation (CalTrans) includes the provision of future high speed rail service (over 125 mph) that is being developed by the California High Speed Rail Authority (CHSRA). CalTrans has been supportive of high speed rail since the early 1990's, when it was involved in the California High-Speed Rail Commission, which found in 1996 that high-speed rail in California is technically, environmentally and economically feasible and would be self-sufficient after construction.

Subsequent environmental reviews were completed with the CHSRA as the State-level lead agency and the FRA as the federal level lead agency; including a State-level and federal level Tier I Environmental Impact Statement (EIS). The final document, dated November 2, 2005, identifies high-speed rail as the preferred system alternative to meet California's future intercity travel demand.

7 LEGISLATIVE ACTIONS

7.a FEDERAL, STATE AND/OR LOCAL LEGISLATION

7.a.1 Authorize and create a sponsoring entity for the project

Federal

The U.S. Department of Transportation, Federal Railroad Administration (FRA) HSIPR Program will coordinate state efforts, administer the federal capital fund for corridor development, and lead the establishment of HSR at the federal level. Recognizing the progress made by FRA (especially in light of the urgency of ARRA's funding timelines) a need exists for additional personnel with backgrounds in HSR to assist FRA in administering the program and evaluating the expected high-volume of proposals.

Although FRA and Amtrak recently introduced intercity passenger rail metrics as required by PRIIA §207, FRA lacks proven metrics to quantify many of the HSIPR Program evaluation criteria, such as "economic recovery benefits," "sustainability of benefits," and "transportation benefits," all of which will be necessary to objectively weigh applications.

In addition to creating new measurement tools, additional steps are necessary to ensure that HSR grant funds are allocated to sustainable projects. The creation of a dedicated "national infrastructure bank" would facilitate the non-political, objective allocation of HSIPR Program funds. See section 9(e) for a discussion of this proposal.

State

Some states have passed legislation to create HSR "authorities." Designated bodies, as compared to State Departments of Transportation, often have (a) unity of mission; (b) liberty to develop innovative project development strategies; and (c) independent boards of directors. As a result, if properly designed and executed, these authorities are independent bodies with distinct political and funding purposes. While this approach can be successful, HSR authorities have not always been insulated from the political process. As a result, state political support for HSR must be maintained regardless of the type of sponsoring entity used.

7.a.2 Remove legal impediments to project implementation

Procurement

- *Standardization:* States are responsible for the procurement of the goods and services necessary to develop HSR. However, the HSIPR Program does not provide specific guidelines for state procurement. Federal law provides general guidelines for the use of ARRA funds and, more generally, federal grant funds. However, state procurement law will govern the process by which HSR contracts are awarded (e.g. competition requirements, decisions concerning contract-type, and protest rules). The proliferation of "local content" procurement rules threatens to limit competition by enacting barriers to entry and to bog down the development process as entities pursue protests and other state-level litigation. In an effort to standardize state procurement rules, FRA should

work with states to establish guidelines for the transparent, competitive, ethical, and accountable award of HSR-related contracts. The Federal Acquisition Regulation (FAR) and the Model Procurement Coder are natural starting points.

- *Competition:* FRA should mandate the use of full and open competition in the award of HSR contracts at the state level. While competitive procurement appears to be preferred, FRA guidance permits states to “sole source” contracts so long as they provide the appropriate “legal justification” (terms like “sole source” and “legal justification” are not defined).

There may be a middle ground between full and open competition and sole source procurement: the Federal Acquisition Regulation (FAR) provides for a variety of “two-step” procurement processes whereby a small group of pre-selected firms are contracted to provide short-term conceptual proposals (reducing the project’s technical uncertainties), and the procuring entity then “down-selects” to form a full-term contract with a selected firm. There are various methods of doing this, all of which will achieve states’ goals of selecting the strongest industry partner possible while recognizing the need for expediency. SNCF is happy to share with the FRA its extensive experience with similar pre-selection processes whereby the procuring entity narrows the field of interested competitors, using both technical and financial criteria, to a handful of highly qualified consortiums.

- *Early Operator Involvement:* Early operator involvement remains a critical evaluation factor because it demonstrates states’ commitment to the sustainable long-term operation of the HSR system. The two-step procurement method encourages early operator involvement - the process by which an operator provides advice regarding the planning, design, or construction of the system before the system is fully operational. Early operator involvement is essential to project success because project designers often overlook issues of importance to operations, for example, life-cycle costs, standardization, and ease of maintenance. By consulting the operator (or multiple potential operators) at in the planning phases, early operator involvement creates “benefit sustainability” by eliminating avoidable costs that could potentially arise during operations.

Experienced operators have a wealth of knowledge in areas that are critical to the success and long-term sustainability of the system:

- Preparing solicitations: operators, as the “end users” of the future system, should be highly involved in the design process;
- Safety and operational capacity: operator personnel are often the best qualified to gauge the future operational capacity and safety of the system;
- Standardization and Interoperability: the operator’s experience is an invaluable asset to ensure the workability of the design and proposed equipment;
- Maintenance: factoring life-cycle costs and maintenance requirements into the initial planning is essential to long-term sustainability.

Since early operator involvement is critical to protecting HSIPR Program investments, FRA should consider instructing program applicants to utilize this procurement process.

- *Organizational Conflicts of Interest:* Due to the relatively small pool of firms with advanced technical expertise in HSR, certain firms may be called upon to wear multiple “hats” in the development process – for instance: project management, design consulting, and procurement services. Organizational conflicts of interest (OCI) will inevitably arise in this environment. FRA should work with states to develop guidelines for the avoidance and/or mitigation of OCI at the state level.

“Buy American”

It is universally acknowledged that the United States must draw heavily on foreign expertise and experience to move forward successfully with true high speed rail in America.

The Interim Guidance, PRIIA §221, ARRA, and other legislation contain sometimes contradictory domestic sourcing requirements – imposing a maze of regulatory obligations. Though certain exceptions exist, these requirements create an elusive and ill-defined compliance obligation for firms that supply HSR-related goods and services.

Additionally, state procurement laws may impose further regulatory obstacles. The ability of states to impose extra “Buy American” restrictions or to selectively ascribe to federal trade agreements may render ARRA’s primary exceptions for “Buy American” compliance (e.g. public interest, excessive cost, and single source) moot and could effectively create a pure “Buy American” requirement.

Federal guidance on this issue is necessary, especially to address (a) states’ ability to selectively ascribe to the WTO Agreement on Government Procurement; (b) the extent and availability of the Secretary of Transportation’s “public interest” waiver power to state and local procurements; and (c) the interplay between the various “Buy American” requirements of recent legislation, U.S. obligations under its trade agreements, existing regulations, and state law.

7.a.3 Otherwise facilitate project

FRA should strongly consider assembling a designated team consisting of individuals with backgrounds in HSR project design to assist the implementation of the HSIPR Program. Additional resources – in terms of manpower and expertise – will be necessary to evaluate proposals and to draft the standards and regulations necessary for the successful roll-out of the program. Specialized teams may also be necessary to advise recipients of HSIPR Program funding on best practices. Selected respondents to this RFEI could fulfill one or all of these functions.

7.b PUBLIC FUNDING COMMITMENTS, FEDERAL, STATE AND/OR LOCAL

HSR programs will require extensive public funding until systems become self-sustaining. FRA has acknowledged that \$8 billion is an “initial down payment” on a national HSR system. The massive infrastructure and rolling stock investments necessary to begin HSR operations on a single corridor will require significantly more federal investment. Once systems are in place, additional subsidies may be necessary until ridership reaches a level where sustainability is achieved. In consideration of states’ precarious budgetary situations, as well as the scale of the required investment, the majority of funds will necessarily originate

from the federal government. Even in states where a political will exists, multi-billion dollar state investments may be impossible.

In light of the above, industry partners should bring significant financial resources to all projects. Due to SNCF's strong financial position, it has been able to contribute its own resources to HSR projects in several contexts. In addition to providing contractual services, SNCF has become an investor in foreign HSR projects. SNCF is the key HSR player in Europe and has stakes in seven separate joint ventures. Most recently, SNCF became an equity-holder in Italy's NTV, the first world's first fully-private HSR initiative.

Another form of private investment, public-private partnerships (P3) will also reduce the need for state and federal funding. Sharing the revenue risks of HSR projects through a P3 reduces the need for long-term operating subsidies. SNCF has formed multiple P3 contracts – mostly in Europe, where there is a long-history of using P3 contracts – that have embraced various forms of public/private financing and risk allocation. SNCF is happy to share its experiences with P3 financing with the FRA.

7.c LEGISLATIVE ACTIONS / GOVERNMENT-SPONSORED PROGRAMS

The Railroad Rehabilitation and Improvement Financing program (RRIF) and the Transportation Infrastructure Finance and Innovation Act (TIFIA) are among the financing plans that could bolster HSR infrastructure investment. These programs, along with other innovative initiatives like state infrastructure banks and the Rail Line Relocation Project, will support private sector investments and provide critical additional capital and credit to recipients of HSIPR Program funding.

While each program has been successful, both will need to be adapted for high-speed rail projects. To allow HSR projects to benefit from RRIF and TIFIA and similar credit-assistance programs, the following legislative actions are suggested:

- Allow for longer repayment periods. These programs require repayment to begin within 5-6 years of loan disbursement. For HSR projects, which may not be fully operational or revenue-producing for at least a decade, this repayment timeline may limit the availability of federal loans and credit.
- Reduce fees. Both programs impose significant fees on recipients. TIFIA borrowers may be required to pay a credit processing fee that typically ranges from \$200,000 - \$300,000. Recipients of RRIF funds must pay the credit risk premium over the life of the loan (the "subsidy cost"). RRIF applicants may be required to pay an investigation charge of up to one half of one percent of the principle amount of the direct loan or the portion of the loan to be guaranteed.
- Expand the programs. Both programs have been successful and should be expanded to accommodate the funding and credit requirements of the President's ambitious high-speed rail program. TIFIA's budget authority limits its potential financing capacity and the program cannot meet the growing demand. Additionally, TIFIA can only finance 33% of the total project cost. Currently, RRIF reserves a portion of its funding for non-Class I freight railroads; a similar set-aside should be made for passenger rail projects.
- Eliminate Buy American requirements. Holding recipients of RRIF direct loans and loan guarantees to Buy American requirements is unnecessary and will limit competition. For a more in-depth discussion of Buy America, see the response to 7(a).

8 COMPLIANCE WITH FEDERAL, STATE AND LOCAL LAWS

8.a RIGHTS AND STATUS OF EMPLOYEES

SNCF operates under stringent French retirement, labor, and unemployment laws applicable to its approximately 180,000 employees. Providing the passenger and rail service for all of France, SNCF has vast experience in complying with some of the strongest worker protection laws in the world and the Company has an excellent understanding of how to operate effective compliance programs for the benefit of its workers.

The development of high speed rail service in the United States will follow the high standards that SNCF has historically met and will be implemented to fully comply with all applicable Federal, state, and local laws. In connecting France to neighboring European states, SNCF has acquired a great deal of hands-on experience dealing not only with French laws but those of other countries as well. Existing SNCF labor compliance programs will be modified and expanded to meet the requirements of all United States laws at every level of government regarding retirement, labor, unemployment, and other applicable worker protection laws.

The SNCF U.S. labor compliance program will give specific emphasis to ensuring compliance with the employee requirements of section 24405 of title 49 of the United States Code. That section mandates that any entity that meets the definition of a “rail carrier” must comply with certain Federal laws including the Railroad Retirement Act (43 U.S.C. 231 et seq.), the Railroad Labor Act (43 U.S.C. 151 et seq.), and the Railroad Unemployment Insurance Act (45 U.S.C. 351 et seq.). SNCF has a long history of successfully collaborating with labor unions and operating under collective labor agreements that will enable the company to easily meet this requirement.

As part of its compliance obligations, SNCF will appoint internal compliance officers, work with U.S. labor compliance experts, and fully participate in both mandatory and voluntary government-provided compliance assistance programs. Additionally, SNCF will enact progressive compliance policies, create training materials for company officials and employees, and set a high standard for strict compliance with all relevant United States employment laws.

8.b RAIL SAFETY AND SECURITY LAWS, ORDERS AND REGULATIONS

The hallmark of world-class, high-speed rail is safety; and SNCF has an unblemished safety record. In roughly 27 years of operating HSR at the highest speeds in the world, there has not been a single fatal accident involving a SNCF high-speed train. There is no question that SNCF can and will comply with all U.S. safety regulations.

Existing U.S. rail safety regulations are extensive. However, to develop European or Asian-style HSR in the United States, these regulations will need to be reviewed or address pressing issues such as (a) HSR “express” service operating at over 150 mph; (b) real-time system monitoring; (c) interaction between freight-commuter-HSR; and (d) standards for high-speed passenger equipment. FRA is currently reviewing European and worldwide equipment standards and developing guidance for HSR trains operating at up to 220 mph. Input from operators of advanced HSR systems will aid this process.

Rail “connectivity” – particularly the ability of high-speed trains to operate on track shared with other rail operators – is an important attribute of rail transportation systems.

Connectivity permits HSR benefits to be shared with the entire rail system until a dedicated high-speed system is built.

However, unlike in Europe, U.S. safety rules prohibit for the time being the use of HSR train sets on conventional tracks. If this is not changed, new HSR trainsets will need to be modified to create buffers and other protections in the event of a crash. The issue is not to jeopardize by doing so, the main characteristic of the train (axle load in particular, a key factor of safety). Some "anticrash" features technically proven and fitted on European HSR could obtain the same result. This issue ought to be carefully addressed.

Other hypotheses on this issue are currently studied by FRA.

The use of PTC signaling system is imposed as first step by 2008 RSIA.

Modern operation management procedures (cf. OCC described in chapter 4) contribute also to reach this goal by establishing close relationship between the various operators.

SNCF is more than ready to work closely with US FRA authority to set appropriate rules in order not only to keep the existing level of safety, but to enhance it.

8.c ENVIRONMENTAL LAWS AND REGULATIONS

8.c.1 Compliance with environmental laws and regulations

As necessary, SNCF intends to participate with the applicable high-speed rail sponsoring entity as a co-proponent of the project through the NEPA processes. The High-Speed Intercity Passenger Rail (HSIPR) grant program requires some form of NEPA documentation to be eligible for Tracks 2 and 4 and certain Track 1 funding.

For many advanced applications, a programmatic EIS (Environmental Impact Statement) has been prepared which identifies for most sections of the HSR the environmentally preferred corridor or in some cases, alternate corridors. From the programmatic EIS, tiered EIS' can be completed to address site-specific environmental, social, historic, archeological and species impacts. The programmatic EIS reduces the range of transportation alternative corridors to be analyzed in subsequent tiered EIS for each section of the HSR. However, TGV systems should be considered as the preferred alternative for means of HSR; SNCF would provide critical data and information on TGV technology and functioning.

Since it is unlikely that the tiered EIS for various HSR segments can be completed simultaneously, a plan will be developed based upon preferred construction schedules, likely extent of impacts, and anticipated length of time to complete each tiered EIS, to schedule the order for tiered EIS's.

Because SNCF may – depending upon the particular project – participate and oversee the construction of specific HSR facilities, operate the HSR system and provide long-term maintenance, its input on key elements of the tiered EIS' will better assure a successful HSR project. The tiered EIS will evaluate alternate corridors, use of different existing rail lines and new and revised rail stations. SNCF's expertise in operating similar systems will contribute significant knowledge and operational experience critical for fully evaluating such alternatives in the EIS.

The EIS' must evaluate the proposed project and its likely impacts. Impacts from the project can sometimes be avoided, i.e., realignment; or mitigated. Realignments are considered as an alternate through the tiered EIS.

Mitigations can be developed in accordance with CEQ (Council on Environmental Quality) guidelines to assure the projects' impacts are minimized. However, certain statutory schemes, such as the Endangered Species Act and the Clean Water Act, Section 404 (wetlands) require

specific mitigations. Often, several options for mitigation exist and SNCF can provide its insights as to whether particular mitigations would render the HSR project infeasible or more difficult to complete and operate. Developing uniform mitigations for certain “common” types of impacts can reduce costs and, moreover, improve the level of mitigation completion. As a co-proponent of the HSR project and participation in the NEPA process, SNCF assures that there is a seamless connection and understanding of the mitigation requirements.

The completed programmatic EIS finds that the extent of wetlands impacts will require a “LEDPA” determination. The U.S. Army Corps of Engineers and EPA require that NEPA decisions be based upon the “Least Environmentally Damaging Practicable Alternative” (“LEDPA”) when impacts to wetlands are considered significant. This standard is more restrictive than NEPA’s requirement for the agency to make its decisions following a review of reasonable practicable alternatives. The LEDPA requirements should be considered in scheduling tiered EIS preparation, and as an initial screening factor for alternatives and mitigations. SNCF can assist with identification and evaluation of alternatives and mitigation strategies for the HSR project. And, SNCF’s expertise will help assure that the final project design, including such mitigations, remains a commercially viable project that serves the intended purposes and needs.

Compliance with specific federal statutory mandates, including the Historic Preservation Act, will be initially addressed through the NEPA process. Historical and cultural site surveys will identify and classify such sites and evaluate those potential sites in concert with State Historic Preservation Officer (SHPO) and NEPA experts will be completed. Thereafter, appropriate preservation alternatives for each site will be recommended to the SHPO. Those preservations will be timely implemented as the HSR project is developed. However, despite such surveys and reviews, it is possible that historic or cultural artifacts not identified in the survey could be encountered during construction. If that occurs, SNCF will instruct its crews to stop work in the area until appropriate consultation with the SHPO occurs, and any necessary preservation actions are completed.

8.c.2 Compliance with Federal, state and local requirements

SNCF’s experience with projects of this magnitude demonstrates the importance of organization, including the development and implementation of project permitting checklists. The myriad of such federal, state and local permits, and the diversity of issues considered, is extensive. A coordinated effort is essential. An initial determination by the rail authority of the permits “pre-empted” by its jurisdiction may reduce permitting requirements. However, even if permits are pre-empted, in the spirit of governmental respect and cooperation, the HSR proponents would consult with these agencies regarding the HSR project and the agency’s support for, and any concerns related to, the proposed HSR project. For all permits, a permit schedule matrix would be developed, tracking the status of permit applications and decisions, and any conditions or mitigations.

Permit applications for federal and state permits will be prepared and filed, although final decisions may be deferred until the appropriate tiered EIS for the affected area is completed. Local permitting actions can occur concurrently with the EIS process.

8.d THE AMERICANS WITH DISABILITIES ACT

In May 2000, the European Commission adopted [“A Communication Towards a Barrier-Free Europe for People with Disabilities”](#) which has built a framework for improving access for the disabled throughout Europe. On February 11, 2005, France implemented its own “Disability Act,” which requires all public transportation to be fully accessible to the disabled



within 10 years of the Act's passage. Under Article 45 of the Act, French transportation authorities are required to develop particularized "Accessibility Transport Master Schemes," including accessibility outreach programs, investment plans, and the creation of special modes of transportation to substitute for non-accessible regular services. At the national level, "Intercity commissions" meet annually to assess the accessibility of infrastructure, public space, and public transportation. Accessibility has become an important topic for political reform in France, and SNCF has been actively engaged on this issue.

SNCF is well on-the-way to compliance with the Disability Act and the company has invested significant resources to improve access to SNCF facilities and trains. Accessibility has been at the heart of SNCF's on-going renovation plans: starting in 2005, SNCF invested 500 million Euros to make the entire travel process accessible for persons with all forms of disability (visual, auditory, motive, mental, or cognitive).

As our accessibility efforts in France have demonstrated, SNCF intends to be the standard bearer for transportation accessibility in the United States. As a part of this mission, the Company intends to be in full compliance with the Americans with Disabilities Act (ADA). SNCF is prepared to meet USDOT regulations applicable to Intercity Rail Cars and Systems; Fixed Facilities and Stations; and all other applicable rules, as specified by chapter 49 of the Code of Federal Regulations (CFR) and other relevant regulations.

SNCF also intends to work closely with the Federal Railroad Administration to ensure that all SNCF operations in the United States are fully ADA-compliant. Indeed, this dialogue has already begun. Last summer, French representatives attended the first-ever US/European Transportation Accessibility Workshop hosted by the U.S. Federal Transit Administration (FTA). SNCF hopes to continue this conversation and is confident that it can not only comply with the ADA, but also introduce new accessibility best practices to the United States.

9 OPTIONAL CONTENTS

9.a CONTRACTING STRUCTURE TO PROVIDE THE MOST EFFECTIVE ALLOCATION OF THE RISK BETWEEN PRIVATE AND PUBLIC SECTORS

Various contractual agreements can result in a transfer of risk and responsibility between public and private partners.

The optimal contracting structure will depend on the scope of risk and responsibility that the public sector is willing to transfer. Broadly speaking, the wider the risk transfer is, the more sophisticated and complex the contracting structure is.

Only a detailed legal, technical and financial feasibility study in close cooperation with the concerned authorities suffices to exhaust all arguments in favor of or against one structuring option versus another.

For illustrative purposes in our financial analysis, presented in section 5.j, the constitution of a SPC dedicated to operations and maintenance has been assumed.

But, for instance, if the public authorities were willing to transfer a very wide scope of financing and risk, public-private partnership (“P3”) arrangements are an increasingly accepted method to support the development of infrastructure projects.

9.b PRIVATE SECTOR INVOLVEMENT - PROCUREMENT STRATEGY

Private sector firms tend to be most willing to accept risk in those areas where they hold the most experience. For instance, in case of complex arrangements such as P3, considering that each Railway Project components calls upon a dedicated high-tech core business competency, one should have in mind that leading such arrangements may thus require a multi-party private sector consortium.

In other words:

- One private sector firm may express concern about one of the project’s components dealing with its individual area(s) of expertise: public authorities could then procure the project’s components separately such as, but not limited to, an option with separate procurement for EPC and O&M contracts
- Several private sector firms may express concern about integration among the various project components outside of their respective individual area(s) of expertise: public authorities could hence prefer to procure one single procurement for several Project’s components such as, but not limited to, a DBOM or a P3 contracts.

9.c PROJECT FINANCING STRUCTURE

On a purely financial point of view, project’s financing could rely on revenue generated by the Project (mainly commercial ticket fares) to pay for part of its cost.

But the cost of financing would be much higher in such a case, compared to a public-backed financing, because of the level of risks associated. To limit this cost, the Project sponsors would have two major levers:

- The private partners responsible for operations and revenue generation, and their credibility : SNCF believes that the sponsors of the Project would be able to

minimize financing costs by having SNCF as a main partner considering its extensive and successful experience in HSR, and its proven ability to maximize revenues

- Public support mechanisms to offer a minimal level of guarantee.

9.d ROLE OF PUBLIC SECTOR COMMITMENTS IN FINANCING THE PROJECT

The parts of the Project's cost that can not be financed by the cash flows generated by the Project have to be fully backed by the public sector commitments. Such commitments could be, depending on public sector constraints and objectives, direct public financing, or fully guaranteed private financing.

On the parts of the Project's cost financed directly through the Project's cash flows, the public sector commitments will directly influence the cost of this financing.

9.e MEASURES OR COMMITMENTS TO PROVIDE AND FACILITATE MULTI-YEAR FEDERAL COMMITMENTS

As mentioned elsewhere in this proposal, the development of HSR in the United States will require a large up-front investment. The demand for funding is great – as demonstrated by the overwhelming response to the HSIPR Program's Pre-Application phase. Introducing service on a single corridor, for instance the California corridor, may require the appropriation of over \$30 billion. Subsequent annual appropriations may also be necessary. Although the annual appropriation of \$1 billion/year for the next five years contained in President Obama's most recent federal budget is a start, HSR will require more funding over a longer period of time.

To facilitate funding of this scale, Congress will need to reevaluate the process by which national infrastructure projects are funded. For example, the creation of a national infrastructure bank that would provide grants and loans for HSR projects would be an important first-step towards reevaluating U.S. transportation priorities and funding merit-based projects.

The American Recovery and Reinvestment Act (ARRA) included \$8 billion in federal funds to act as a down payment on a national high speed rail corridor system. The House Appropriations Committee recently approved an additional \$ 4 billion per year to continue for five years in addition to the initial ARRA investment. However, even with that investment, high speed rail remains at a firm disadvantage for funding a major new system without a substantial federal government commitment. Presently, federal funding for high speed rail is derived from general revenues appropriated by Congress. This funding mechanism forces high speed rail to compete with other non-transportation projects for federal funds.

When President Obama announced his commitment for a national HSR system, he compared his vision for the proposal to that of President Eisenhower when he helped create the modern interstate highway system. Using the interstate funding example would be the best alternative to fund a large scale high speed rail system such as the President is proposing. The Federal-Aid Highway Act of 1956, commonly called the National Interstate and Defense Highway Act of 1956, set aside \$25 billion dollars to construct 41,000 miles of interstate roads over a 20 year period. The federal government pays for the system through the Highway Trust Fund that was created through the legislation. The money for the Trust Fund comes from the users of the highway system indirectly through a federal fuel tax. Funds for the Highway Trust Fund go directly to the general treasury and are then credited to the fund. Through the

creation of this fund, highway projects do not have to compete with no transportation projects for funds. Legislation based on this model is the most likely way to fund such a large high speed rail system at one time.

9.f ROLE OF PRIVATE EQUITY IN FINANCING THE PROJECT

For “Greenfield” projects in the railway sector such as the California HSR, equity could be injected by the Private Promoters or Sponsors of the project, such as railway operators (like SNCF), contractors and manufacturers, if the contracting structure chosen requires it. Private equity investment funds could also be involved, in particular funds dedicated to such Greenfield projects. After few years of operations, i.e. once the main risks have been overcome by the initial Sponsors of the project (such as construction risk and traffic risk), other private equity funds (Brownfield infrastructure funds for instance) could then play a significant role in the Project’s refinancing.

9.g KEY CONSIDERATIONS TO ENCOURAGE OR DISSUADE PRIVATE SECTOR INVOLVEMENT

Statement of our opinion on the factors that will encourage or discourage private sector involvement in high-speed rail in America are (i) what will attract or repel private sector investment (financing); and (ii) what will attract private sector involvement in design, construction and operation.

Globally speaking, the attractiveness of the project will depend on the balance between the risks the authorities are willing to transfer, the ability of the private sector to manage them in the timeframe of the project (and, in particular, their "degree of freedom"), and the expected returns.

For example, the private sector will only take on financing risk (traffic for example) if the federal and state governments commit sufficient resources now and in the future (e.g., through a Rail Infrastructure Trust) to build the system, and if the operator is sufficiently experienced, such as SNCF, and has enough leverage to fix tariffs, marketing and distribution policies, for instance, to optimize traffic and revenue generation.

Traffic and revenue forecast are a key success factor. The SNCF has developed a set of models providing accuracy. This accuracy has been proved making the comparison between the forecast and the observed traffic along the years. This experienced knowledge provides the appropriate number of train sets in order to optimize the operating plan.

9.h STRUCTURES AND MODELS TO GUIDE THE COMMISSIONS

In light of the development of the Obama Administration’s High-Speed Intercity Passenger Rail (HSIPR) Program, state rail planners and HSR authorities have largely overlooked this Request for Expressions of Interest (RFEI). As a result, it will be necessary to amend the §502 commission process to account for these changed circumstances.

In most cases, the proposed commission members described in §502 are currently involved in the application process for HSIPR Program grants at the state level. Rather than develop separate federally-appointed commissions, FRA should work to facilitate information exchange between these stakeholders and RFEI respondents in conjunction with the HSIPR Program. For instance, FRA might convene stakeholder meetings to discuss particular RFEI responses, or portions of responses, that are “sufficiently credible to warrant further consideration.” These exchanges could take place as FRA counsels applicants for Track 2 funding, or following the award of federal grants.

9.i CONTRIBUTION TO THE DEVELOPMENT OF A NATIONAL HSR SYSTEM

- SNCF's response provides a glimpse into what SNCF seeks to bring to the United States and contributes an experienced perspective to this burgeoning, but new, marketplace for HSR operations and services
- SNCF has been a global leader in high-speed rail operations and infrastructure management for over twenty-five years. We offer a wide-range of expertise covering all aspects of high-speed rail network development – extending from the planning phases through the operation and maintenance of a mature high-speed system. In addition to operating the highly-successful French national railway system, we are extensively involved in the international high-speed rail marketplace.
- SNCF's entry into the U.S. HSR operations market fosters competition, driving down costs and improving service in U.S. market. American consumers demand transportation options – both in terms of mode and provider. SNCF hopes to fill the void for high-speed rail in the United States.
- SNCF's response also provides needed understanding of building and operating a national high-speed system. As the French National Railway, SNCF has seen the development of France's high-speed system from its humble beginnings as a single service line to a leading international system. As an established provider, SNCF is capable of assisting the Federal Railroad Administration in any and all aspects of project development

APPENDIX 1. Resumes





Jean-Pierre ORSI, Project Director

PROFILE

Project Director, Jean-Pierre ORSI first qualified as an engineer at the Ecole Centrale in Paris (1976) before going on to obtain a Doctorate in Civil Engineering (specialization Infrastructure) at the Ecole Nationale des Ponts & Chaussées, Paris (1978).

He has worked for the French railroads in various capacities over the past 30 years, at both **SNCF**, the National Railroad company, and at **SYSTRA** (formerly SOFRERAIL), the leading railroad and public

transportation engineering company. Jean-Pierre is a highly reputed civil engineer, infrastructure manager, management controller and business developer with a wealth of experience in Project Management, especially in connection with high-speed rail. His involvement in new line projects in France and other countries is bound to be an invaluable asset.

Fluent in his native French and in English, Jean-Pierre also has a passive knowledge of Italian, Portuguese and Spanish.

AREAS OF EXPERTISE & EXPERIENCE

Jean-Pierre Orsi has a proven track record in fields such as program management and financial agreements for high-speed rail network development and implementation of new high-speed services, railroad infrastructure construction and maintenance (conventional and high-speed technology), railroad operation including high-speed and

commuter trains on the busiest Paris suburban rapid transit line, organization and development, transportation planning, network design, asset management and management consultancy in public transportation, including tramways (Light Rail) and automatic metro systems.

As Deputy to the Regional Director at SNCF in charge of Infrastructure (building, maintenance, development) in a changing environment, Jean-Pierre's responsibilities included supervising the work of several thousand depot engineers, designing and carrying out major reorganization operations targeting greater efficiency, and management of a € 600 million unit. In addition, during his 12 years at SYSTRA, he spearheaded Group development in Europe, boosting business in Central and Eastern Europe and chairing the Boards of Group companies in Spain, Italy, and in the UK. His business development and project management skills were vital factors in all these roles.

Between 2007 and 2009, Jean-Pierre Orsi was **Project Director for TGV West and South West** at SNCF. In this capacity he was responsible for planning new services linked to the extension of the high-speed network (182 km [115 miles] towards Brittany and 302 km [188 miles] towards Aquitaine) and for negotiating agreements with the State, local government, RFF, and the private sector (Public-Private Partnership).

This followed a period as **Director Europe** at SYSTRA (2004 to 2007), where he was accountable for the Group's non-French results in Europe and a Member of the Executive Committee. At the same time he was Chairman of RLE Governing Board, designer and project manager for the high-speed rail link between London and the Channel Tunnel and Chairman of MVA Consultancy Ltd, SYSTRA's subsidiary in the UK (transportation planning), and other subsidiaries in Spain and Italy.

From 2000 to 2004 Jean-Pierre was Engineering Director at SYSTRA and, as such, responsible for Company production activities and performance, coordinating the engineering resources of SYSTRA, SNCF

and RATP and those of SYSTRA Group subsidiaries, quality assurance, and CEO of Toulouse-based engineering firm, SOTEC.

As Infrastructure Director (Paris South-East Region) at SNCF from 1997 to 2000, Jean-Pierre was responsible for operations, maintenance and renewal work and infrastructure improvement projects and in charge of managing train traffic, capacity allocation, train safety management, infrastructure maintenance and capital investment works. He managed major infrastructure projects: renewal work on the Paris-Lyons high-speed line, adaptation of the line for a 20% increase in capacity and speeds of 300 km/h (+/- 185 mph) and improving traffic management to allow for a 30% increase in revenue traffic at Paris-Lyon station.

In 1996-1997, he was Head of Development and Management in the Marseilles Region, where his role was to produce regional strategic policy, maintain consistency between targets and action plans, create and coordinate a regional capital investment plan and manage multi-faceted projects, and where he had the further tasks of managing land development projects, procurement and supervising regional management.

This was preceded by a period in the same region as Chief Civil Engineer (1993-1996) in charge of infrastructure maintenance, design and improvement work as part of the TGV Mediterranean 2001 project. His assignments included construction of underground railroad track to bypass Monaco, including an landmark underground station.

Jean-Pierre's first secondment to SYSTRA was from 1988 to where, as a member of the Management Committee, he participated in the creation of SYSTRA (merger of SOFRERAIL and SOFRETU). He also headed the Africa business unit, where he was involved in the construction of a 500



km (310 mile) railroad line in Nacala Cuamba and the creation of a Railroad training centre in Inhambane (Mozambique). Jean-Pierre first joined SNCF in 1979 and, in his first ten years in the company, held various positions in the field in the track and

civil works areas (organization of maintenance, implementation of new methods and techniques), which enabled him to obtain hands-on experience of the railroad business at grassroots level.



Karine MEYER

PROFILE

Karine MEYER (38) has an extremely strong background in mathematics, economics and econometric analysis. She holds a doctorate (PhD) in Economics (Paris, Sorbonne University, 1998) in addition to a Master's degree in Applied Economics and Economic Sciences (1993), and a Postgraduate diploma in Mathematical Economics and Econometrics (1994). Karine has worked for the railroad industry since 1995, initially with French National Railroads (SNCF) and subsequently with SYSTRA, its consultancy joint venture.

In the past four years, Karine has worked on evaluating the economic factors connected with both freight and high-speed rail passenger transport. She has led a number of new line and line enhancement projects, encompassing a wide variety of different disciplines (optimization, fleet number and deployment analysis, maintenance policy, fare structures and systems, etc.). At SYSTRA, she has developed considerable experience in working with the Regional Councils (local transportation authorities) in negotiating the introduction of clockface services, accommodating the often

conflicting interests of users/sponsors and infrastructure providers.

Karine's particular specialty is socio-economic analysis, more particularly for new HS line projects. In the course of her career, she has provided vital socio-economic and traffic forecast input to preliminary studies for new HS lines and line extensions in different parts of France and abroad. She was Project Manager and Coordinator for line sections such as Paris-Limoges and Paris-London via Amiens, addressing issues in the fields of operations, ROW and environment. Her fortes also include modeling potential traffic flows and global analysis of system components. In the first half of 2009, Karine worked on the Haramain High Speed Rail Project (HHR) on behalf of the Saudi Railways Organization, spearheading preparation of the specifications for operations, rolling stock, maintenance, fare policy, financial and performance requirements.

She has extensive technical software skills and a good knowledge of English, some Spanish and Italian in addition to her mother

tongue of French. She is also the author of a number of well-received publications and has lectured on topics connected with Economics and Econometrics. All these skills, combined with her solid experience of

railroad project management, strategic optimization processes and business planning, make her an excellent participant in any ambitious long-term railroad development project.

AREAS OF EXPERTISE & EXPERIENCE

Karine Meyer embarked on her career in 1994, when she spent a year working at the French Ministry of Public Works and Transportation (1994-95), producing freight traffic models, and studying the short and long-term relations between traffic and economic growth.

From there she moved to SNCF and the position of Research Assistant in the Strategy Division, where her role consisted of developing a freight traffic forecasting model, conducting strategic analyses and freight traffic modeling (1995-1998). Subsequently, from 1998-2000, Karine was Head of the Budget Division in the Freight Department at SNCF in charge of a team of 40 management auditors and overseeing all budget activities.

This was followed by a period (2000-2003) as a Project Manager in the Freight Division in the Car Transportation Business Unit. There her tasks included supervising negotiations between sales personnel and clients, and ensuring the implementation of Service Agreements and of decision making tools.

In 2003-2004, Karine was employed as Head of Passenger Traffic Forecasts at the SNCF Strategy and Development Division, where she reviewed the existing passenger traffic forecasting models, masterminded software upgrading operations, and

developed a new passenger traffic forecasting tool in connection with the creation of new stations.

On joining SYSTRA in 2004, Karine Meyer first worked as a Research Engineer and Project Manager before taking over the responsibility for various Transportation Economics Units. In this capacity she has conducted traffic forecasts, market research, socio-economic analyses and traffic flow modeling exercises for RFF, produced Master Plans for both SNCF and RFF, carried out socio-economic analyses for the Moroccan Railroads (2005), provided expert input for work on devising a suitable infrastructure charging system for the Macedonian Railways (2007), contributed to background work on projects in Saudi Arabia, and used her in-depth knowledge of transport economics in freight traffic studies for Lyon Turin Ferroviaire (SAS), the Franco-Italian joint venture for freight flows between the two countries (2008). In the course of her activities at Systra, she has frequently turned her skills and competencies to traffic and transport demand studies, economic appraisals including operating and maintenance costs, and liaising with other engineering and design departments. She is experienced in project management, channeling the various expert contributions into a consistent and comprehensive package.



Scheherazade ZEKRI- CHEVALLET

PROFILE

Scheherazade Zekri-Chevallet (39) graduated from Baruch College, City University of New York with an MBA in Marketing Management in 1996. This followed her earlier studies in Paris, France, where she had obtained the equivalent of a Master's Degree in Industrial Economics in 1993 and a Post Graduate Degree (cum laude) in Industrial Organization and Marketing Strategy in the same year.

After a number of short-term consultancy appointments in France and the USA, Scheherazade entered the rail sector, where she has since worked in Marketing, Sales & Distribution and subsequently Management in the USA, the UK, Belgium and France for a total of 13 years.

Her key skills lie in the fields of sales development and marketing, distribution and promotion, market benchmarking, revenue optimization, project management and international strategy. Her in-depth experience of these areas, including on the US market, should prove an enormous asset in any ambitious project.

Scheherazade is fluent in her native French and in English and has a working knowledge of Spanish. She is also a former member of a team with several victories in the French National Women's Volley Ball championships to its credit.

AREAS OF EXPERTISE & EXPERIENCE

Since January 2009, Scheherazade has been Director Business Development Non-European Markets, Long Distance Passenger Services at SNCF Voyages (French Railroads). In this capacity one of her responsibilities is that of identifying and

developing SNCF high-speed projects outside Europe, including for example partnerships, tender procedures and other opportunities.

Before taking up her current position, she was Managing Director, Rail Europe Continentale, based in the Belgian capital of Brussels from 2002 to 2008. This distribution subsidiary of SNCF Voyages handles the marketing and distribution of SNCF products in Continental Europe (all markets excluding France & UK), consists of a team of over 100 employees based in six different European countries, and has total revenues of € 225 million.

Scheherazade's achievements during her period at the head of this organization included restructuring operations by consolidating 5 European companies (Spain, Italy, Switzerland, Germany and Benelux) under one common European management (finance, controlling, HR, marketing, sales & distribution), economic review and implementation of a new business model, definition of marketing & distribution strategy to maximize sales and contain distribution costs, launching new channels such as GDS and Internet (www.tgv-europe.com and www.raileurope.eu) for the sale of SNCF products on European markets, a new distribution network in Eastern Europe and a representative office in Warsaw (Poland). She was also in charge of handling relationships with stakeholders, European railroads, the travel industry (travel agencies and tour operators) and tourist offices. In 2003-2004 she had the additional function of Managing Director of Rail Europe UK and was a board member up to the end of 2005.

From 1999 to 2002, Scheherazade was Director of Distribution for the Eurostar Group in London, UK. Her responsibilities included heading the www.eurostar.com project, in other words creation of a site to develop Internet-based sales (20% of distribution mix within 2 years) as a single booking process and a unique brand &

customer experience, coordinating distribution in core markets, maximizing revenues in international markets such as the USA, Asia and selected European countries, and handling distribution projects such as CRM studies in order to foster stronger relationships with distributors. Scheherazade was also Head of International Sales for the Eurostar Group, her achievements in this capacity consisting of developing and maximizing international sales, setting up distribution agreements and managing relationships with General Sales Agents (GSA), international product definition and pricing to optimize revenue growth, and producing marketing plans and promotional offers for such markets.

From 1996 to 1999, Schererazade was Marketing & Distribution Manager for the Rail Europe Group, Inc. in White Plains, New York, a position that involved her in the marketing and distribution of European rail products, high-speed products in particular, on the North American market, producing marketing plans for specific products, channels and/or markets, sales monitoring, training of key US tour operators in rail products and marketing studies in Mexico to evaluate potential, build business relationships and/or partnerships and develop sales.

Before embarking on her career in the railroad industry, Scheherazade was a Management Support Consultant for the Invest In France Agency, DATAR (French government organization) in New York, worked on cross-cultural training programs for Prudential Relocation Management, an intercultural training and consulting firm in New York, held the position of Project Manager at Paris-based marketing research firm, Stratega, undertaking prospective and strategic studies, acted as a Consultant for



the Sinorg Corporation (leading software consulting company on the local municipality market), and completed a brief

sales promotion assignment with Perrier, the sparkling mineral water company.



Guillaume GENIN

PROFILE

Originally a law graduate, who obtained his first degree and post-graduate qualifications at the University of Paris II, France between 1992 and 1997, Guillaume (34), also studied English Law (Contract, Commercial and Intellectual Property) at University College of London (UCL) in 2000-2001.

Since then, he has built on these foundations to pursue a career in business development and management, largely in English-speaking countries. He has been a member

of teams that have successfully bid for a number of important transport contracts. Although his mother tongue is French, he has a fluent command of English, which he combines with a comprehensive understanding of the different legal systems in France, the UK and North America and in-depth experience of the US passenger transportation market. All this knowledge and experience will be invaluable in the context of the current project.

AREAS OF EXPERTISE & EXPERIENCE

Guillaume Genin is currently employed at **French National Railways (SNCF)** as **Business Development Manager for North America**, also responsible for Long Distance Passenger Services (Montreal). His functions include devising and applying strategies for exploiting SNCF's high-speed

rail expertise by identifying opportunities, participating in RFP submissions, creating PR and marketing products to raise brand and skills awareness on the market and establishing partnering strategies.

Until recently, he was **Business Development Manager** for **KEOLIS**

(North America), where he spent 3 years producing and applying strategic plans for external and organic growth on the North American market: market analysis, identification of opportunities/approaches, brand and expertise visibility on the market (including vis-à-vis APTA), securing teams of local experts and consultants, etc. Consequently, he has an excellent understanding of the US market in general, and the passenger transportation market and its requirements, in particular. He was also **Project Director** for pre-qualification offers for the operation of commuter train and tram systems in Melbourne (Australia).

From January 2002 to May 2006, Guillaume worked for **KEOLIS (UK)** in London as a **Legal Advisor** for Business Development. His tasks included preparation of RFP submissions for the award of passenger rail (heavy and light) and/or bus operation contracts (UK, Italy, Sweden): negotiation of joint venture/shareholder agreements with partners; review, analysis and negotiation of legal documentation and ensuring compliance with regulatory requirements; preparation of risk matrices identifying commercial, financial, operational and legal risks and appropriate mitigation measures; procurement of new rolling stock where relevant; negotiation of financial covenants with financial institutions; management of external consultants and advisors; follow-up of legal affairs of operating entities in the **Keolis UK** portfolio. During this period, the company bid successfully for the following

contracts: **Transpennine Express** (2003), **Integrated Kent Franchise** (2004-2006), **Liverpool Tram** (2004 - 2005). It was also one of the last two bidders for **Merseyrail Electrics** (2003) - **Docklands Light Railway** (2005).

Guillaume's other activities consisted of drafting and negotiating contracts with consultants or suppliers/service providers, producing confidentiality agreements, drafting regular internal reports/memoranda and updates in relation with the transportation industry, setting up mobilization/transition plans for RFP, conducting an Internal Audit of Canadian subsidiary (Orleans Express/Acadian in Quebec), contributing to the Group workshop on Sustainable Development and implementing EFQM quality indicators, as well as various Communications and HR-related activities.

Before joining **KEOLIS**, Guillaume spent two years as a **Legal Officer** with **Connex Transport UK** in London working on the sale of Connex South Central Ltd (operating subsidiary) employment, supply and service contracts, Intellectual Property issues, producing internal legal opinions and memoranda, etc. He began his career working at **Les Editions du Moniteur** in Paris (March 1999 – September 1999) and at Law firm, Mayer, Brown & Platt in New York as a **Corporate Legal Assistant** (January 1998 – December 1998).



Pierre TILHOU

PROFILE

Pierre TILHOU is presently Vice-President Marketing at STRING THEORY a New York-based marketing lab servicing the travel & leisure industries and aiming to deliver innovative marketing strategies with a focus on process consistency.

Pierre holds an MBA from the ESSEC Business School in Paris (1992-1996). In the 12 years of his career to date, he has been involved in a number of big budget

marketing projects and has a solid track record in terms of results obtained.

Pierre has been working in the USA since 005 and has in-depth knowledge of the American passenger traffic market. In addition to his native French, he speaks fluent English and Spanish. His particular combination of local market knowledge, market research experience, railroad background and language skills makes him an ideal candidate to play a vital role in the current project.

AREAS OF EXPERTISE & EXPERIENCE

Pierre joined **STRING THEORY** in March 2009 as **Vice-President Marketing** with responsibility, among other things, for analyzing client issues and environments in order to propose strategic working frameworks, setting up and managing *ad hoc* teams to deliver on strategies and

ensuring constant process consistency and conformity with business targets.

Before taking up this position, he spent nearly four years as **Vice-President Marketing** at the **Rail Europe Group** in New York, a group selling rail travel products to the North American market, at the time in the process of reinventing itself

to move from being a trade-oriented vendor to a multi-channel consumer brand. There his responsibilities and achievements included brand repositioning and rollout through collaborative work and extensive market research, orchestrating design and implementation of the new website unveiled in November 2008, launching innovative and redesigning existing travel products, monitoring all marketing budget allocations and managing a relatively small but dynamic marketing team. Since initiating its new brand strategy, Rail Europe has returned to steady growth and increased its share of the intra-European travel market, generating extra revenue despite difficult market conditions.

Previously employed by the Eurostar Group Ltd in London (UK), as Head of Products & Research, from November 2004 to July 2005 Pierre was in charge the New Product Introduction and the Product & Research Departments. Since Eurostar growth on the corporate market had leveled off, he and his teams had the task of conducting in-depth analysis of operating costs in cooperation with Finance Department, re-designing class of service architecture with the introduction of the “Business Premier” class and working with the On-Board Services Department and external providers to implement the new services. Their efforts were successful, as evidenced by the fact that after 12 months with the new system, Eurostar was able to announce growth of 16% within the business

market and a record market share in relation to the competition. From January 2001 to October 2004, Pierre was Head of Marketing (France) for Eurostar, creating and implementing the annual marketing plan, managing relationships with agencies with an USD 18 million budget.

His achievements included designing pricing architecture for new fare ranges introduced in March 2003, developing award-winning campaigns including the Grand Prix Stratégie Affichage & Radio 2002 and the Prix du Club des DA 2002 & 2003. Largely as a result of his efforts, by 2004, sales returned to pre-9/11 levels, breaking the record numbers reached in 2000. This followed a six-month period, from July 1999 to December 2000, in which as **Leisure Market Manager for France & Belgium**, he devised an annual marketing plan, including creation of the Night Trip, Kids Free, and Day Trip products, launched eurostarplanet.com, a website promoting London as Parisians' favorite destination and coordinated commercial activities, including communications and sales.

Pierre began his profession career in the **Main-Line Department** of SNCF, where he spent two years (1997-1999) as **Youth Marketing Manager** re-launching the 12-25 youth card by negotiating new partnership strategies with other rail and air carriers.



Jean-Marc GALIMONT

PROFILE

Jean-Marc Galimont (51) is a Railroad Operating Expert, who has worked at French Railroads (SNCF) since 1979. He joined the company as a University graduate with a degree in Marketing Technologies and Techniques.

Jean-Marc's key skills lie in the fields of feasibility and capacity studies, timetable simulation with IT tools, modeling, unit and staff optimization, operations analysis, and performance and safety management. Throughout his career, he has constantly been involved in the railroad operations and safety departments, and has held responsibility for managing railroad traffic and safety in real time on the Paris suburban

network. Since 1990, he has been in charge introducing the most efficient forms of organization and installations, running the gamut from pre-feasibility studies through to the design and scheduling of detailed work plans.

Jean-Marc has worked on numerous occasions with the SNCF's consultancy arm, **SYSTRA**, where he has been employed as such since 2006, putting his business and operations expertise to the service of various major projects in countries such as Oman, the UK, Morocco, Egypt, Romania and France. He speaks English in addition to his native French.

AREAS OF EXPERTISE & EXPERIENCE

Jean-Marc Galimont began his career at SNCF as a **Traffic Safety and Operations**

Operative in 1979 in the Paris Region. Four years later, having acquired substantial

hands-on knowledge and experience of the practicalities of railroad operations, he moved to **Station and Signal Box management**, running suburban stations and classification yards and coordinating works operations, supervising staff safety and dispensing training.

Between 1985 and 1990 Jean-Marc worked at the **Traffic Control Center** of the Paris North Region, first holding the position of **Traffic Controller** between Paris-Lille and Paris-Brussels, monitoring and managing real-time traffic movements and then as a Freight Controller in charge of supervising regional freight carriers.

From 1990 to 1997 Jean-Marc was a Research and Design Officer in the Greater Paris Division of the SNCF Civil Engineer's Department. Over this period, he fulfilled a large number of functions, for example designing preliminary security plans a major construction site and introducing more stringent security freight yard and workshop conditions (access control, video surveillance, etc.). He also played a part in designing passenger information programs and telephone, intercom and radio telephone systems for a new commuter line, its stations and tunnels, including work on the corresponding man/machine interfaces. He also contributed to the Automatic Vehicle Identification Project and to railroad signaling programs for the Lyon TGV stabling track area.

It was at the end of this period that Jean-Marc undertook his first assignment for SYSTRA, in his capacity as Railroad Operations Expert. In 1997-98, he was seconded to Kuala Lumpur (Malaysia) to work on the Construction of the new Central Station. His role included railroad operation and security programs (OHL programs and

Overhead line programs, signage, design of Extra-Low-Voltage programs for the Public Address and Public Information Systems, telecom, intercom, radio, intrusion systems, CCTV, MATV, etc.), passenger flow organization, functional organization, services and facilities in passenger and technical areas. Later he also worked on works phasing and provided design assistance for the station (1998-2001).

During this latter period he was also employed at SNCF as a Research Officer producing feasibility, capacity and signaling studies and developing capacity assessments, infrastructure alterations and timetable specifications for future high-speed services in the South of France.

Between 2001 and 2006 Jean-Marc was **Operations Manager** at SNCF, working regularly on behalf of **KEOLIS UK**, a subsidiary of SNCF, on capacity studies, clockface service concepts, train diagram and roster optimization for a number of the new railroad operating companies and for the infrastructure manager, Railtrack in the UK. He also performed assignments in connection with safety, timetabling and capacity in Norway, the Netherlands and Sweden.

Since his return to **SYSTRA** in 2006, Jean-Marc has worked on operating documents for France's first PPP project (CDG Airport Express), on pre-feasibility studies for the **Romania** network on behalf of CFR Calatori (operator) and CFR SA (infrastructure manager), for clockfaced intercity services and regional services, in auditing existing transportation and planning tools, and proposing software improvements from design to implementation. He has carried out pre-feasibility studies on the Kuwait-Muscat corridor (Gulf Cooperation

Council) in the **Persian Gulf**, given expert assistance in optimizing signaling blocks and control systems in **Egypt**, designed an high-speed operating program for Greengauge21 in the **UK**, conducted operating studies for high-speed lines in

Morocco, and spearheaded operating studies as part of a feasibility study for railroads in **Oman** and **Yemen**, a very varied program of activities completed within a three-year timeframe.



Dominique RULENS

PROFILE

Dominique Rulens (50) is a Chartered Civil Engineer specializing in earthworks, highways and drainage systems. In the course of his career to date he has developed considerable expertise in infrastructure and transport project management, from preliminary design through to system integration and turnkey delivery. He joined French Railroads (SNCF) in 1982 and has since worked for the company in a variety of capacities as well as for the rail and urban transport consultancy firm, Systra, an SNCF - RATP (Paris Transport Authority) joint venture. Over the past two years Dominique

has spearheaded the Systra team based in San Francisco working on the CHSR project. In addition to his native French he speaks fluent English and some German and is highly skilled in the use of design (AUTOCAD, ROMULUS), planning (Microsoft Project, PSN 7) and network capacity (CAPRES) software. His contribution to current projects should prove invaluable in view of his experience in the USA and his heightened awareness of the issues surrounding the development of high-speed rail services in the country.

AREAS OF EXPERTISE & EXPERIENCE

Presently Dominique is a member of the team working on proposals for the US high-speed rail corridor projects. Until recently he was in California with the **CHRSA** providing assistance in developing rail

infrastructure regulations and contributing to plans for the State's first high-speed line. In 2008 he was also **Project Manager** in the **Systra** team responsible for formulating

proposals for a new high-speed rail link between Lisbon and Madrid.

Dominique's experience in the high-speed rail sector dates back to 1989, when he was placed in charge of coordinating the activities of the **civil engineering design team and work sites** of the high-speed line in the North of France (**TGV Nord**).

This was followed, in 1994, by a period contributing to studies connected with bids for the **Channel Tunnel Rail Link** between France and the UK. Then, between 1995 and 1997, he spent more than two years at the head of a **Design Group** based in Marseilles, where he was responsible for supervising earthworks and drainage systems for the Mediterranean high-speed line on behalf of **SNCF**.

At the end of 1997 Dominique transferred to London to take up a position as a **Senior Engineer** working on secondment to **Systra – Rail Link Engineering**. There he took part in preliminary reconnaissance work in the Thames Valley area and produced design studies for major part of the earthworks and drainage operations. He remained in the UK through until the middle of 2003, in the last two years of this period acting as an **Infrastructure Consultant** for **Keolis UK**,

analyzing existing infrastructure of networks under tender for concession in order to propose investment measures to boost capacity and minimize performance reliability risks.

From July 2003 to July 2007, Dominique was on assignment to French Infrastructure Manager, **RFF** (Réseau Ferré de France), as a **Project Manager** with the role of providing assistance in organizing the handover of the new high-speed line in Eastern France (and on towards Germany and Switzerland) to the client, line commissioning and obtaining official infrastructure approval, and assisting **RFF** and **SNCF** in the construction of three new stations on the line. Not least, he was a member of the team involved in the world speed record on conventional rail of 574.8 km/h (357.2 mph) on 3 April 2007.

In the early years of his career, Dominique gained valuable experience working as a **Draughtsman** (1980/81) and as a **Site Manager** (1981/1982) both for private companies, before joining **SNCF** and working his way up the ranks from **Station Manager** and **Operations Assistant** to **Civil Engineering Project Manager** working on ambitious large-scale projects.



Gerard PITAULT

PROFILE

Gérard Pitault (42) is a **railway engineer** specializing in the **Maintenance and Operation of High-Speed Trains**. After graduating in Engineering from the College of Engineers in Belfort (France), he joined French National Railroads (**SNCF**) in 1992 and has since pursued a strong technical and managerially-oriented career. As a recent example, Gérard was heavily involved in the establishment of the Lyons "Technicenter", a center inaugurated in March 2009 and dedicated to the maintenance of high-speed trains, the most modern of all such centers in France.

In addition to being an accomplished manager at the head of teams of up to 200 people, Gérard also has a well-honed capacity for strategic vision, an excellent knowledge of risk management, good project management skills and substantial change management experience. His strategic vision, analytical capabilities, creative approach and hand-on technical high-speed rolling stock knowledge and experience make him an invaluable participant in new high-speed rail projects. Gérard has a good working knowledge of English.

AREAS OF EXPERTISE & EXPERIENCE

From 2005 to 2009, Gérard was Project Manager for the new Lyons Technicenter.

As such he was responsible for staff recruitment and training (340 employees in

8 different technical areas), producing organization charts, establishing working conditions, negotiating with staff representatives, taking delivery of the tools and facilities needed for future maintenance operations. He also masterminded the official inauguration of the center, a project, collated material in support of the decision-making process, handled administrative procedures and worked on the schedules for the various works phases.

Over the 2001-2002 period, Gérard was a Maintenance Consultant seconded to the Eurostar Group in London, where he conducted an analysis and produced a plan of action designed to boost performance and efficiency at the Group's depot in North Pole (London).

This was preceded by a period (1997-2001) as Project Manager for the second-round of renovation and refurbishment work on the first generation of high-speed trains (Paris –

hallmark event for both SNCF and the region.

Earlier (2002-2005), Gérard was Operations Director for the planning stages for the new \$350 million Center. In this

capacity he assisted in compiling the functional specifications for the Lyons). The project consisted of organizing and conducting the necessary operations on a fleet of 42 trainsets in time for the opening of the next section of the line through to the French Mediterranean Coast.

From 1994 to 1997, Gérard headed the Boiler Works and Paint Shop at the Oullins Maintenance Technicenter, leading a team of 120 people responsible for all metalworking, welding and painting operations on electric locomotives. Previous to this, he spent five years in charge of a freight locomotive maintenance depot.



Andreas HEYM

PROFILE

Andreas Heym qualified as an architect at the University of Karlsruhe in Germany in 1984. He specializes in the creative process of designing public areas, public buildings and intermodal transport terminals and integrating them into their urban environment. His design work focuses on accessibility, functional layout and the corresponding volumes and structures. He is particularly skilled in the design and development of complex spaces and urban environments.

Since 1987 Andreas has participated in all major SNCF station design projects, from the TGV Atlantic, North and Mediterranean lines to the TGV East, as well as in other major French and international projects. He is experienced both in designing new railroad stations and interchange points for high-speed lines and in upgrading existing stations, especially those of historic importance. His skills and vision will play a

vital part in these aspects of any rail transportation development project.

As Director of International Development with **AREP Ville**, a subsidiary of the French National Railroads (**SNCF**) that designs multimodal interchange hubs and handles related urban planning, Andreas has been involved in projects in the USA where, as a member of a team studying the future San Francisco Bay Area Regional Rail Plan for the Metropolitan Transport Commission (MTC), he was responsible for stations and where he led an AREP team participating in a feasibility study for transforming Union City station into a multimodal interchange.

From 1991 to 2008, Andreas Heym was **Secretary** of the **Watford Group**, the international association of railroad architects, designers and other design professionals. He speaks fluent English and French in addition to his native German.

AREAS OF EXPERTISE & EXPERIENCE



Since 2006, Andreas Heym has been Senior
Project Director and Director of

International Development at AREP Ville.
From 1995 to 2005 he was Head of the

Station Services Design Department of the **SNCF Architecture Division**, where he was responsible for producing intermodality master plans, passenger service and interior design studies and information design and station furniture development.

Major projects on which Andreas has worked include architecture and urban design studies for transforming the present at-grade Lodz-Fabryczna terminus station into an underground station for through high-speed trains in **Lodz, Poland** (2009), in partnership with SNCF subsidiary SYSTRA, ongoing studies to update the master plan of the Krasnoyarsk urban area in **Russia** with Russian State Planning Institute, Giprogor (2008-2009), a feasibility study for the development of the Lviv station precincts, for Lviv Railroads, **Ukraine** (2008), also together with SYSTRA, design studies for a Polish-Canadian commercial developer for a shopping center at Poznan Station in **Poland** (2008), and preliminary design studies for the integration of a government office complex within the station precincts and transformation of the historical station building into a shopping center at **Budapest Nyugati Station, Hungary** (2007-2008).

Between 2006 and 2008 Andreas was responsible for stations in an Earth Tech-led team studying the future **San Francisco Bay Area** Regional Rail Plan and in charge of feasibility studies for station development and environmental integration as well as basic station layout designs. Previously he had led the AREP team designing a high-rise office complex at the **MOSKOVSKY** Center, **Saint Petersburg, Russia** and worked with the ROMA Design Group and Earth Tech on a feasibility study for transforming the BART Union City station in **California** into a multimodal interchange, integrating other train and bus operators (2005-2007).

Between 2001 and 2007, Andreas was **Head** of the **SNCF Station Services Department**, and worked with AREP on the construction of 3 new and renovation of 16 existing stations, including transformation of Paris Gare-de-l'Est and extension of Strasbourg main station, leading intermodality, passenger service layout and information system design studies. Between 1996 and 2001 he spearheaded intermodality, service and information system design work on 3 new TGV stations at Valence, Avignon and Aix-en-Provence and for extension of the existing Marseilles St-Charles station and, from 1993 to 1995, he was responsible for TGV East high-speed line station design studies in preparation for the environmental impact report required by French law.

Earlier Andreas led a feasibility study for the extension of Heidelberg Station (**Germany**) to include a new parking lot, bus station, commercial facilities, offices and a hotel in collaboration with German Railroads (DB) (1998-1999), headed the station design team of SNCF subsidiary, SYSTRA, for the preliminary study into transforming the existing station at St. Pancras, London (**UK**) into a high speed terminal for the Channel Tunnel Rail Link: passenger flow analysis, connectivity, capacity and service layout scenarios (1995), was responsible for the conceptual design phase of restructuring the intermodal hub at Paris Gare-du-Nord Station, **France** at the interface between TGV trains and regional trains, subways and buses, as well as an adjacent office development over the tracks (1992-1994), worked on architectural analyses, project consistency studies and station furniture design studies for the 4 new TGV stations at Paris-North, Roissy-Charles-de-Gaulle-Airport, Marne-la-Vallée - Disneyland and Lille-Europe (1991-1994) and was responsible for architectural



coordination as well as service layout studies during the design and construction of

Before joining SNCF and AREP, Andreas worked from 1984 to 1987 in the Paris studio of environmental sculptor Dani Karavan on large-scale landscape and urban design projects, including the "Axe Majeur" Urban Design Project for the New Town of

the Paris Montparnasse TGV station in readiness for the TGV Atlantic High Speed Line (1987–1990).

Cergy-Pontoise, near Paris. Between 1984 and 1986 he also assisted Dani Karavan in designing and developing the Wallraf-Richartz-Museum public square and its links to the cathedral and the main railroad station in the City of Cologne, Germany.



Mikaël LANNOY

PROFILE

Mikaël Lannoy (33) has both Bachelor's and Master's degrees in **Urban Development** obtained from the **University of Lyons** (France) in 1997 and 1998. He has also completed two post-graduate courses at the Institute of Town Planning (together with the School of Architecture and National College of Civil Engineering – ENTPE), also in Lyons, one in "Operational town planning and contracting" (1999) and the other in "Town planning, urban development and management" (2000). Before joining French National Railroads (**SNCF**) in 2001, Mikaël completed internships working on a number of urban development, land use planning and conversion projects in different parts of France. He has also taken part in an exchange program between French and German Railroads (DB Station & Service AG, Berlin), which enabled him to broaden his international horizons (2006). Since then, Mikaël has been able to build on this experience in the **"Stations" Project**

Group set by the International Union of Railroads (**UIC**) to benchmark factors such as best commercial opportunities, accessibility for the mobility-impaired, intermodal interchanges and facilities management (safety, cleanliness, etc.), which he has led since September 2007.

Mikaël has robust computer skills, not least with CAD software such as AUTO CAD, and has a good working knowledge of English, Spanish and German in addition to his native French. His recent experience with international projects and his strong background in station planning have given him extensive insight into the importance of maximizing station development potential and transforming stations not only into vital interchange points but also into lifestyle venues offering essential facilities, basic and more sophisticated retail outlets, catering services and the like, to the benefit of both the operator and his passengers/customers.

AREAS OF EXPERTISE & EXPERIENCE

After completing his studies, in 2001 Mikaël entered one of the SNCF's **Regional Real Estate** departments in Paris and was given the task of **rationalizing railroad property** and **developing station sites** (disposals, property rentals, urban development projects, creation of multi-modal hubs) and of handling relations with the local authorities over town planning issues.

He moved to new responsibilities in 2005, when he joined the **Main Stations and Connections Department** and took charge of the development of a number of major provincial stations. There he addressed planning and organizational issues relating to the interchange function of these various stations and masterminded a number of design and works projects for their conversion and modernization. He also drew

up a program for the rehabilitation of the stations at Chartres, Dreux and Paris-Gare de Lyon.

In April 2008 Mikaël took on the role of **International Project Manager**, a function that he fulfils in parallel to his activities on Stations at UIC. In this new capacity, he is responsible for the "twin stations" project, a project that involves forging partnerships with similar stations in other countries in order to pool experience, exchange information on common issues, gain a better understanding of how things work in other countries and developing the intercultural skills of station personnel. The project includes extensive benchmarking over organizational matters but also extends to contributing to the station part of major international high-speed line projects.



Olivier PICQ

PROFILE

Olivier Picq (41) holds a Master of Economics (1990) and a Master of Engineering and Economics (1991) from the University of Aix-Marseilles and a postgraduate diploma in Economics, Mathematics and Econometrics from the Centre National de Recherche Scientifique (CNRS), France (1991). Olivier has made his career in the railroad industry. At French National Railroads (SNCF), he has acquired a thorough theoretical and practical grounding in all aspects of high-speed rail operations (routing, operating center management and customer relations) and has extensive experience in railroad engineering consultancy and in marketing and distributing railroad products in Europe and the USA. Through his work in transportation economics at SNCF and at SYSTRA, its engineering consultancy arm, he has gained in-depth knowledge of traffic forecasting, preparing methods and tools, operational planning for high-speed rail projects and management of engineering projects. He developed the traffic forecasting models used by the French Railroads for predicting traffic and calculating passenger and freight flows

associated with the commissioning of new high-speed rail lines, in France and abroad. He has contributed to general socio-economic analyses and modal competition studies.

Olivier is no stranger to the US market, having been heavily involved in studies and forecasting in connection with the proposed Florida High Speed Transportation System. Based in Florida as a resident member of Florida Overland eXpress between 1996 and 1999, for example, he was responsible for high-speed rail operational planning studies and investment-grade ridership and revenue studies undertaken by the Florida Department of Transportation for the planned high-speed rail link between Miami, Orlando and Tampa.

Olivier has also taught transportation economics at the Ecole des Ponts et Chaussées in Paris, led in-house seminars on the economic assessment of high-speed rail projects, and given talks on high-speed rail traffic forecasts and operations in France for the South-Korean, Amtrak, Swedish and Spanish Railroads. He has an extensive research background and speaks French, English, German, Spanish and Romanian.

AREAS OF EXPERTISE & EXPERIENCE

Since 2006 Olivier Picq has been Project Manager for the Provence-Alpes-Côte d'Azur Regional Division of SNCF in charge of developing the master plan for regional rail services in South-Eastern France (regional, high speed and freight trains), modernizing regional⁹³ lines, completing new stations, devising passenger and freight strategies, establishing an investment program and analyzing its corporate financial repercussions.

Before this, he spent two years as Project Manager for the East European high-speed line (2004-2006) with responsibility for ensuring that the line linking Paris to Strasbourg, Munich, Frankfurt and Zurich was ready for commissioning in June 2007 and for finalizing the operating program, commercial and marketing activities, traffic forecasts, and the business model. Earlier Olivier spent two years in the High-Speed Rail Development Division, as Manager for TGV projects in France and Europe.

As Marketing Director for Europe at SYSTRA, Europe Division from 2000-2001, Olivier had the task of developing commercial and marketing activities and managing urban and railroad engineering studies, civil and signaling works and transportation planning contracts in Western and Eastern Europe.

This was preceded by a period (1999-2000) with Rail Europe Inc, in New York as Rail Product Director, Marketing Department in charge of developing and managing rail products, negotiating with partners their introduction on the North American market, communicating with the call centers and sales force, monitoring and reporting on sales, marketing analyses, customer/trade

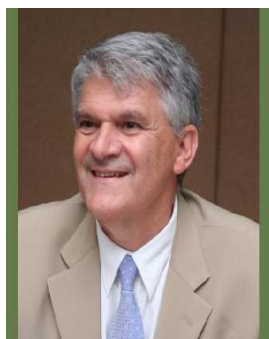
surveys, pricing proposals, promotional actions and marketing plan.

From 1996 to 1999 Olivier worked as an Economist and Statistician for the SYSTRA, High-Speed Rail Projects Division, and took part in studies for new high-speed rail lines in Europe (Spain, England, Germany, Italy) and in the rest of the world (Canada, Australia, USA, Asia). This followed a period (1994-1996) at the SNCF, Main Lines Department, Development and Strategy Division, also as an Economist/Statistician, working on the preparation of the high-speed rail master plan at French and European level, and an earlier period (1992-1994) in a similar capacity in the New Infrastructure and High-Speed Rail Department. Olivier's first railroad post was in 1989 as a Researcher at the SNCF, Strategy and Planning Division.

SYSTRA assignments:

Project Manager - economic and design engineering studies, Spain (1999), Project Manager - rehabilitating and electrifying the Bucharest-Brasov corridor, Romania (1999), Resident Member of Florida Overland eXpress, USA (1996-1999), Project Manager Canada (1997), Inter-City passenger market survey - tilting train, Russia, Belarus, Poland, Germany (1996), Member of the advisory committee reviewing ridership and studying operation of the Channel Tunnel high speed rail link, UK (1996), Review of ridership studies in Taiwan (1996), Project Manager - Sydney-Canberra high-speed train feasibility study, Australia (1995), USA - Florida (1995), Indonesia (1995), South Africa - Mozambique (1995), France (1995), UK (1994-1995), Italy (1994), USA - Florida (1994), Spain (1992-1994), Canada (1992-1994), Malaysia

(1994), Sweden (1993-1994), Italy (1992-1993), USA – Texas (1992-1993), South Korea (1992).



Jean-Pierre ARDUIN

PROFILE & ASSOCIATIONS

Jean-Pierre Arduin (59) has more than 35 years of transportation sector experience and is presently Advisor to the Chairman of SNCF International and Senior Transportation Economist at the Transport Research Institute (TRI) in London UK. He first graduated in 1973 as a civil engineer from Ecole Nationale Supérieure des Mines. He then studied at the Ecole Nationale de la Statistique et des Etudes Economiques (ENSAE) where he obtained a further higher degree in 1975. Jean-Pierre also has qualifications in Mathematics, Physics and Economics and holds a diploma in chemistry. He is a member of the French Association of Statisticians and of the French Association of Civil Engineers.

Jean-Pierre Arduin has worked for and with French National Railroads in various capacities since 1976. Over the years he has been involved in a wide variety of international projects, conducting studies and participating in R & D activities. He acquired a thorough theoretical and practical

grounding in all operations sector fields (routing, operations center management and customer relations while at SNCF and also gained in-depth experience in management in general and in the evaluation of major railway projects in particular: rail traffic surveys and multimodal model calibration, working assumptions and scenarios, rail traffic forecasts, simulation of operations, capital investment estimates, calculation of economic and socio-economic rates of return, and simulation of project financing. He is skilled in the field of strategic planning, tariff policy, marketing and competition evaluation, marketing strategies and finance and has developed the traffic forecasting models used by SNCF for traffic planning and calculating passenger and freight flows associated with the commissioning of new high-speed lines in both France and elsewhere. He has participated in high-speed rail studies in France, Europe and North America (Texas, California, Florida, North Carolina), etc. He was responsible for Franco/German

cooperation over high-speed guided transportation systems. Over the years with SNCF, Jean-Pierre also developed an international career with SYSTRA (formerly SOFRERAIL), and has been involved in major institutional, transportation planning, traffic forecast, simulation of operations, economic and financial projects.

Jean-Pierre's enormous, wide-ranging and internationally recognized experience and his in-depth knowledge of the American market will be vital factors in the current project. The following is a brief overview of the many and various areas in which he has worked in the course of his career:

AREAS OF EXPERTISE & EXPERIENCE

Since 2004 Jean-Pierre Arduin has held the position of Managing Director & Senior Transportation Economist with the Transport Research Institute (TRI). His responsibilities include feasibility studies for passenger and freight traffic projects in the fields of methodology and evaluation of major railway projects, traffic surveys, modeling of transportation demand and traffic forecasts, developing traffic forecast models, simulation of operations, evaluation of operating costs, economic, socio-economic and financial evaluations and institutional relations.

He has participated in projects on behalf of **Réseau Ferré de France (French rail infrastructure manager)** (2006-2008) (Assistance to the concession for the South Europe Atlantic High Speed Line; Peer review of economic and traffic studies for Brittany-Loire Valley High Speed Line project; Economic studies for the Lyons-Turin rail link). He has also worked on the Master Plan for a high speed rail network (India, 2007), on the Saudi Arabia Landbridge Project (transportation demand and traffic forecasts; economic, socio-economic and financial evaluations, 2005-2006), feasibility studies for improving the transport system in Surabaya (Indonesia, 2006-2008) and on infrastructure charges for high-speed services in Europe and regional

high-speed traffic modeling on behalf of the International Union of Railways (UIC).

Between 1996 and 2004, Jean-Pierre worked in a variety of capacities for **SYSTRA (formerly SOFRERAIL)**. His responsibilities included feasibility studies into passenger and freight traffic projects, methodology and evaluation of major railroad projects, traffic surveys, modeling of transportation demand and traffic forecasts, simulation of operations, evaluation of operating costs, economic, socio-economic and financial evaluations and institutional relations. He was involved in projects such as the Channel Tunnel Rail Link, the Hong-Kong Shenzhen Maglev, high-speed rail in Spain and new infrastructure in East European countries.

As **Deputy to the Operations Manager at SYSTRA (American Division)** in 1999-2000, Jean-Pierre Arduin was responsible for all tender documents and railroad projects connected with North, Central and South America and provided expert input for high-speed rail projects. Previously he spent 3 years (1996-1998) working as a **Study Manager** in the **Railroad Transportation Planning Division** on projects in Spain/France, France/Germany, Canada, Spain, Eastern Europe, Australia, Florida, Texas
Barcelona,

Russia/Belarus/Poland/Germany, UK, Italy and Taiwan.

Between 1990 and 1996 Jean-Pierre was **Manager of the Main-Line Marketing Division in the Methods and Modeling Department** at SNCF, where he was in charge of traffic forecasts for the Atlantic and North high-speed lines, the Channel Tunnel, the East European high-speed line, The extension to Valence and Marseilles of the South-East high-speed line and for railroad traffic demand analyses, establishing forecasting models, modal selection and statistical models involving rail traffic level analysis (use of steady elasticity models, Cobb-Douglas functions), gravity and cost-time models, as well as application of Box and Jenkins statistical models to chronological series, new line traffic forecasts for the national high speed network master plan, etc.

On behalf of SNCF, he participated in new line studies in Europe (Germany, Spain, Italy) and other parts of the world (Canada, USA, South Korea). During this period, he also undertook various assignments on behalf of **SOFRERAIL** in Indonesia (passenger and freight traffic studies as part of the feasibility study of the Jakarta-Surabaya rail link and preparation of a rail transportation master plan), Florida (study into a new high-speed rail line between Tampa-Orlando-Miami, UK (Passenger traffic forecasts for the new London-Channel Tunnel high speed rail line, Spain (Passenger traffic and economic profitability studies for new high-speed rail lines between Madrid-Valencia, Alicante and Murcia), Italy (new line traffic forecasts and economic assessments), Texas (traffic studies in the Dallas-Houston-San Antonio triangle, in charge of surveys, advisor to the Engineer), Pakistan (economic study of the high-speed line between Islamabad, Karachi

and Lahore), Serbia (study of a new line to connect with Hungary and Bulgaria via Belgrade), Korea (traffic forecasts and various studies on the new Seoul-Pusan high-speed line), Turkey (traffic surveys and exploitation of results, forecasts for multimodal passenger and freight traffic), Taiwan (traffic forecasts for the new Taipei-Kaohsiung line, France/UK (traffic forecasts for SNCF/EPS/Eurotunnel), France (multimodal traffic study and evaluation of railroad potential, updating of the national high-speed rail network master plan), development of a rail traffic forecast model for new stations - Methodology, data base, calibration, study of the future Alliance supersonic plane system, reports on the North and Mediterranean high-speed lines for the French Ministry of Transportation and other official authorities), France/Spain (in charge of evaluating the relevance of a high speed rail link between Spain and France), France/Italy (passenger traffic forecasts: traffic surveys, modeling and simulation of operations), Portugal (passenger and freight traffic forecasts for the new high-speed line between Lisbon and the Spanish border).

As a **Section Manager** at SNCF from 1983-1990, Jean-Pierre worked in the **Engineering, Planning and Research Division**, essentially on passenger traffic modeling. He also took part in a large number of **SOFRERAIL** projects during this time (Canada, Australia, Brazil, Spain, Morocco, etc.). From 1979-1982 he headed the **Data Processing Section** in the **Passenger Marketing Department**, whilst from 1976, when he first joined SNCF, to 1978 he was **Station Master** in a number of stations of progressively growing importance.

Jean-Pierre Arduin has published numerous articles in different languages in his specialist fields, has taken part in symposia in various different parts of the world and is highly demanded as a University lecturer, in

particular in the fields of Engineering and Transport Economics. More comprehensive details of these activities are available on request.



Ludovic GUITTON

PROFILE

Ludovic Guitton (28) obtained his first degree (specialties: mechanical engineering and economics) at one of France's most prestigious graduate schools, the *Ecole Polytechnique* (2001-2004). He then spent a year at Imperial and University Colleges in London, when he obtained a Master of Science in Transport with special emphasis on demand modeling, quantitative and statistical methods, transport economics and project management (2005). Last but not least, he also qualified as a Master of Business Administration at the *Collège des Ingénieurs* in Paris in 2006, a course which enabled him to broaden his knowledge of corporate finance, project management,

investment tools, business strategy and accounting.

Today Ludovic is employed at **French National Railroads** (SNCF), where his role is essentially that of contributing to the development of company stakeholdings, in particular in other passenger and freight operators in France and abroad, against the backdrop of the new deregulated railroad market in Europe. His thorough grasp of the financial and funding aspects of rail transport companies and projects, and particularly the need to lay robust financial foundations, should prove invaluable for all new railroad sector investment ventures. Ludovic speaks excellent English and quite fluent Spanish.

AREAS OF EXPERTISE & EXPERIENCE

Ludovic joined **SNCF** in 2007 as a Manager in charge of Merger-Acquisition operations. As such, he played a part in the procedures leading up to the acquisition by SNCF of a 20% stake in the new high-speed rail operator, NTV, in Italy, in the acquisition of

a 75% stake in the German freight operator ITL, in the acquisition of a 90% stake in the Société des Trains Expositions, a company whose mission is to organize events on special dedicated trains, where he represents SNCF on the Board of Directors, and in

organizing investment in a number of start-up companies focusing on new green transport-related technologies, such as photovoltaic cell applications or innovative electric vehicles.

Before entering SNCF, Ludovic worked for a year as a **Consultant** at **INDEFI**, a firm specializing in financial engineering for industrial clients and investment funds (business planning, financial modeling, market surveys,). He worked essentially on transport-related projects in the rail, airport and tollway concession sectors. This was preceded by a year with the **IXIS Corporate**

& Investment Bank in Paris. At the bank, Ludovic's role was that of **Financial Analyst** in the infrastructure investment funds division. Here he gained hands-on experience in the funding of brownfield infrastructure projects.

As an undergraduate and postgraduate, Ludovic completed a number of internships, all in different areas of the transport sector, for example at the **Railway Technology Strategy Centre** in London and with **Systra** in Paris, all of which prepared him for a career in the business.



Laurent THORRANCE

PROFILE

Laurent Thorrance (40) is a **Financial Expert, Economist and Engineer** who first graduated as an engineer from the National College of Public Works (ENTPE) in 1992, before going on to obtain a Master of Science in Civil Engineering from the Ecole Centrale in Lyons in 1993, a Master of Economics in International Trade & Markets (1995-1998), a Master of Finance in Financial Management (1997-1998) and, finally, an MBA in Financial Engineering (2000) from the Conservatoire National des Arts et Métiers (CNAM).

Over the past 15 years, Laurent has made the **regulation and financial engineering** aspects of projects with private sector participation (PPP) his specialty and can boast a number of references in **Regulatory Financial Models** connected with infrastructure sector projects for the World Bank. Laurent has worked in both the public and private sectors in France and abroad (over 50 credentials in 27 countries). Since February 2001, he has focused on developing **Axelcium**, the company he founded that specializes in financial consulting on behalf of the public authorities

in relation to PPP projects. Recent projects on which he has worked as a financial engineering consultant include plans for the construction of a high speed railway line between Makkah and Medina (**Saudi Arabia**), where he proposed alternative procurement strategies, the economic and financial aspects of a feasibility study intended to provide a sound basis to enable the 6 **Gulf Cooperation Council** (GCC) Member States (State of Kuwait, United Arab Emirates, Kingdom of Bahrain, State of Qatar, Sultanate of Oman and Kingdom of Saudi Arabia) to decide on plans for a new railway or a potential Build, Operate, and Transfer (BOT) concession, and the feasibility study aimed at setting up an Operating & Management Joint Venture to operate the **East Algerian** Railway.

Laurent is a regular speaker at international seminars organized, among others, by the World Bank on topics relating to financial engineering, public-private partnerships, regulation and concessions in the transport sector. He also lectures on project financing and financial modeling for PPP projects at

one of his alma maters, the CNAM. He is a member of the *Comité des Conseillers & Experts Financiers* (CCEF) (Committee of Financial Advisers and Experts) in Paris.

Laurent speaks excellent English in addition to his native French.

AREAS OF EXPERTISE & EXPERIENCE

Today Laurent Thorrance is Manager at **AXELCIUM**, a company he founded in 2001. Over the years he has contributed to numerous projects, more recently as Financial Adviser for SRO (Saudi Railway Organization) in relation to the Haramain HSR project with an estimated budget of USD 5 billion (2009), as lead expert for the feasibility study of the Damascus Green Line (financed by the European Investment Bank) as the first step towards a future Metro network (2008), as Financial Adviser (within an international consortium) to the Gulf Cooperation Council for the feasibility study into a new railroad (2008), and as Transaction Adviser for developing the land-based oceanic industry in Mauritius (2008). He has also worked on projects in *Senegal* (2005/6, 2007 and 2008), *Macedonia* (World Bank, 2008), *Albania* (2008), Conakry (APC) 2007, in Maghreb countries (*Algeria*, *Morocco* and *Tunisia*) in connection with the EuroMed Transport Project (2007), on the ETUSA business plan (World Bank, 2007), on Ouagadougou project development (*Burkina Faso*, French Development Agency, 2007), in *Tunisia* (EU funds, 2006), on feasibility studies for construction of a new container and new Ro-Ro terminal at the Port of Cotonou (*Benin*, 2006), on extension, equipment and management of the container terminal at the Port of Oran (*Algeria*, 2006), on the East Algerian Railway (French Development Agency, 2006), over the Gautrain Rapid Rail Link Operating Contract (*South Africa*, 2006), on the economic and financial model for the water sector in *Niger* (World Bank,

2005 – 2006), *Dubai LRT Metro Project* (2005), *Lyons-Turin* high-speed rail line project (2005), *Tunisia*, (2 EU-funded projects, 2005-2006), *Ivory Coast* (2 projects, 2005), *Marseilles*, *Le Havre*, *Dunkirk*, *Rouen*, *Nantes-Saint-Nazaire*, *Bordeaux* (2005), the *Republic of Congo*, French Development Agency (2004-2005), *Tunisia*, (EU funds, 2004), the *Democratic Republic of Congo*, (World Bank, 2004-2006), *Africa* (private sector, 2004), *Algiers*, (World Bank, 2004-2005), *Tunisia*, (EU, 2003-2004), *Brazil* (2003), *France* (2002), *Cameroon* (World Bank, 2002-2003), *Congo* (2002-2003), *South Africa* (USAID, 2002-2003), *Dakar-Thiès* tollway (World Bank, 2002-2003), new *Dakar International Airport* (World Bank, 2002-2003).

From 1998 to 2000, Laurent was **Deputy Head** of the Division of Economic and International Affairs at the **French Ministry of Transport, Public Works and Housing**. His responsibilities covered analysis of financial projects linked to PPP operations worldwide (export credit and investment guarantees, financial protocols, feasibility studies, financing and trust funds).

Prior to this, Laurent was a **Project Manager** in the Department of Ports and Inland Waterways at **BCEOM Consulting** (1995-1998), where he worked on business development for new services for PPP projects in developing countries (financial analysis and project financing, planning studies, institutional and restructuring reforms, managing multidisciplinary teams, preparing technical and financial proposals and negotiating contracts with private and

multilateral financing). At BCEOM Laurent worked on projects such as institutional reform of secondary ports in Madagascar, World Bank (1997-1998), the Master Plan Earlier he worked as a **Business Analyst** at the **French Embassy in Cambodia** (1994-1995).

for extension of the Port of Djibouti, Kuwait Funds (1997), a study into modernization of the fruit terminal at the port of Abidjan, African Development Bank (1996).



Pauline PEZERAT

PROFILE

Pauline PEZERAT (24) is a **Junior Financial Expert** with **AXELCIUM**, a consulting firm specializing in financial and regulatory analysis, modeling, and engineering for infrastructure projects in the transport, environment, energy and public facility sectors. Axelcium has frequently partnered **SNCF** in relation to high-speed rail projects.

Pauline graduated from the Business & Management School of the University of Lyons with a Bachelor's degree in Corporate Finance and a Masters in Market Finance.

She also has an Engineering degree in Project and Structured Finance Engineering from the Ecole Nationale des Ponts et Chaussées (ENPC) and the University of Paris X (UPX) and is doing a PhD in the Financial regulation of PPP (Public Private Partnership) projects. She speaks English and some German in addition to her native French.

Pauline's strong business studies background and her consistent approach to detail make her a very useful link in the project conception chain.

AREAS OF EXPERTISE & EXPERIENCE

Pauline is one of the team that has been working on Financial Engineering Services for the Saudi Railways Organization (SRO) and its Haramain High-Speed Rail Project, conducting the financial analyses for an almost 450 km-long new railway line between the holy cities of Makkah and Madinah. The

project aims to cater to the growing number of pilgrims and has an estimated price tag of some USD 7 billion. Pauline's role has been to create a specific financial model for the project and develop a procurement strategy.

During 2009 Pauline has also contributed to Financial Engineering Services in connection with an integrated computing system for urban transportation ticketing and information services on behalf of one of the French administrative areas. Pauline worked on project financing strategy and forecasting return on investment.

Since October 2008, Pauline has been contributing to a feasibility study into the Damascus Green Line (financed by the European Investment Bank), the first stage of a future Metro network. Axeldium is working under contract to Systra for the financial analysis of the project.

She was also Junior Financial Adviser (within an international consortium) to the six-member Gulf Cooperation Council (State of Kuwait, United Arab Emirates, Kingdom of Bahrain, State of Qatar, Sultanate of Oman and Kingdom of Saudi Arabia) handling the economic and financial aspects of a feasibility study designed to provide a sound basis for GCC Members States to decide whether to pursue their plans for a new railway, either as a concession or using a Build, Operate, and Transfer (BOT) approach.

Since 2008 Pauline has also been advising on the financial aspects of Land-Based Oceanic Industry transactions in Mauritius within an international consortium. In September 2008, she organized a training

seminar on Public-Private Partnerships (PPP) in Antananarivo (role, success factors, procurement processes, bankability, sources of funding, financial structures, etc.). Pauline has also provided financial advisory services for a French engineering consulting firm in connection with Macedonian Railroad institutional reform (2008), conducted an audit of the financial model and master plan produced by a Dutch consulting firm acting on behalf of an International Finance Corporation in relation to a new container terminal in the Port of Durres in Albania (2008), assisted in updating the financial modeling for the Autonomous Port of Conakry (APC) (2007), contributed to the assessment of private sector involvement in transport projects via specific sources of funding, especially in three North African countries (Algeria, Morocco and Tunisia), helped to produce a business plan for ETUSA (2007), assisted the Multi-sector Regulation Agency in Niger over its plans for Privatization & Regulation by writing regulatory accounting guidelines (RAG) and contributing to the development of an economic & financial model for the country's water sector (2007), and worked for the French Ministry of Defense (2007) on analysis of the financial statements of major European and American companies in the aerospace and defense sectors.



Benoît ALIADIÈRE

PROFILE

Benoît Aliadière (36) is an expert in Environmental Engineering and Management. He obtained a Master's degree in these disciplines from the University of Paris (1997-98) and is now employed at **Inexia**, the engineering arm of French Railroads (**SNCF**), a company incorporated in 2006. His current position is that of Project Manager, Environment and Sustainable Development.

Benoît can boast extensive experience in managing and conducting the environmental

studies connected with major infrastructure projects. His key skills lie in the fields of overall project management, noise and acoustics-related research, identification of protected animal and bird species, and landscaping studies. He is well acquainted with the requisite administrative procedures and is accustomed to producing carbon inventories using the ADEME method (Bilan Carbone®). Benoît and his team at Inexia have provided the environmental input for the SNCF's response to the current US RFEI. Benoît speaks fluent English.

AREAS OF EXPERTISE & EXPERIENCE

Benoît Aliadière joined **SNCF** full-time in 1999, having earlier spent 3-months on an internship with the company in 1997, working on plans for the Mediterranean high-speed line and ensuring the compliance of proposals with current environmental legislation. In his position as Business Manager, Environment Group, he contributed to the various projects in the

pipeline at SNCF until 2007, when he moved across to the newly-founded **Inexia** company and its Studies and Projects Division, to work as an **Environment Project Manager** and **Senior Research Officer**.

Since joining Inexia, Benoît has provided environmental input to a large number of



ongoing projects, his activities falling into four major areas: preliminary impact and environmental studies, carbon inventories, master plans for "soft" transportation solutions and masterminding landscaping research.

Among Benoît's principal references in these different areas, mention should be made of his role in the preparation of impact studies and documents for major public hearings, work to ensure the compliance of various projects with French legislation on the water

table and water supplies, studies connected with alternative tram-train solutions, for the Greater Paris bypass, for line upgrading in the Lyons region and the bypass to the West of the city. In 2008-2009, Benoît participated in work on the global carbon inventory produced for the whole of SNCF. He has also helped design landscaping solutions to ensure the seamless and harmonious introduction of tram-train services in the Paris suburbs and in the Thur Valley, near Mulhouse in eastern France



Aurélia GRAVET

PROFILE

Aurélia GRAVET (28), who holds a first degree in Management and Economics (2003), followed by a Master's degree in the same subjects (2004) and a post-graduate diploma in Management and Sustainable Development (2006), is a specialist in all matters relating to Sustainable Development at **Inexia**, the engineering arm of French Railroads (**SNCF**). As a Research Officer in this field, she is involved in all studies

directly or indirectly concerned with sustainable development.

Aurélia has been officially authorized by ADEME to use its Bilan Carbone® method in producing carbon inventories and has therefore been in a position to play a special role in work on the environmental dimension of the SNCF's response to the US RFEI.

AREAS OF EXPERTISE & EXPERIENCE

On completing her education, Aurélia Gravet first joined **BCEOM**, an engineering consultancy for major international development projects, essentially in the sectors of transportation, water, environment and energy, economic and institutional advice.

After two years working for this company, she then moved to the Research and Projects

Division at **Inexia**, and its Environment and Sustainable Development Department.

At Inexia, her role is to ensure that all new projects are examined from the sustainable development perspective. She is also responsible for developing Inexia strategy in this field.

Aurélia has conducted a number of carbon inventories since joining Inexia. In 2008-



2009 she contributed to the SNCF inventory process, in 2008 she managed an inventory for Inexia itself at its headquarters and its premises in Besançon and in 2008-2009 she also worked on the carbon footprint of 50 years of operation of the eastern branch of the Rhine-Rhone high-speed line.

Since 2007, she has provided input for sustainable development studies and projects in France and ensured that sustainability principles are constantly applied when assessing scenarios for new railroad ROW.

Another environmental aspect of her activity has related to SNCF policy on bicycle transport and the possibilities for conveying passengers' bicycles with them on board trains ("train+bicycle"). In this connection, she has developed projects and methodologies, been involved in institutional relations and consultations, and participated in events and other communications activities.



Sophie GALICHON

PROFILE

Sophie Galichon (52) is a qualified architect, who also studied urban development at the University of Paris. Her specialist field is that of environmental landscaping and, in this capacity, she has participated in a large number of environmental and landscaping studies for new railroad ROW or adaptations to the highway network. She is currently employed

at French Railroads (**SNCF**), where she is in charge of environmental studies.

Sophie's particular focus is on ensuring that new ROW blends in harmoniously with its environment through clever design and the choice of suitable materials. She has provided input in relation to such aspects as part of SNCF's response to the US RFEI.

AREAS OF EXPERTISE & EXPERIENCE

Sophie Galichon joined **SNCF** in 1982. Until 1992, she worked in the **Buildings Department**, where her role was that of ensuring that civil engineering structures were systematically designed to be in keeping with their local environment, a relatively new concept at the time. She contributed her architectural and design skills to projects such as the Northern France high-speed line (TGV Nord) and plans for the Interconnection between existing high-speed lines. She played a part, for example,

in the design of retaining walls and gardens on the banks of the River Seine to ensure a dual esthetic and noise abatement function.

From 1992 to 2001, Sophie Galichon was **Business Manager, Landscaping Studies** for a series of different high-speed line projects. For the East European high-speed line, she designed specific proposals for vulnerable sites, including presenting them to the public, and worked on

the corresponding landscaping proposals. She also contributed to master plans for landscaping operations on the proposed Rhine-Rhone and Brittany- Loire Valley. Since 2002, Sophie has been in charge of environmental impact studies in the **Line Studies Division** of the Civil Engineer's department. In this capacity her role involves environmental assessments and completion of administrative procedures, development of instruction manuals and

high-speed lines. Last but not least, she developed methods and applications for planting and replanting operations.

guides, and coordination of skills and teams. She has conducted a number of such impact studies, in particular in relation to the high-speed line projects currently in the pipeline, and continues to pursue her efforts to document the measures and processes vital to work on environmental impact.



Jean-Marie METZLER

PROFILE

Jean-Marie Metzler (66) first studied at the Ecole Polytechnique Paris (1962-1964) before going on to graduate as a Civil Engineer from the Ecole Nationale des Ponts et Chaussées (1965-1967), after taking one year out to complete his compulsory national military service as an Officer in South Algeria.

On qualifying, he immediately joined **French National Railroads** (SNCF), where he has since worked for most of his long and illustrious career, holding numerous high-level domestic and international managerial positions.

Jean-Marie Metzler was among the key figures in the very first French high-speed rail project (South-East TGV) and has since put his considerable knowledge and experience at the service of other railroads wishing to adopt similar technology. His enormous analytical capacities, focus and strength of purpose, combined with his elder statesman status in the industry, make his participation in any high-speed rail project a vital factor for success.

Charismatic and an excellent communicator, Jean-Marie Metzler speaks German, English and Italian (spoken and written) in addition to his native French.

AREAS OF EXPERTISE & EXPERIENCE

Over the last two years Jean-Marie Metzler has been **SNCF Project Director** for the **SRO** (Saudi Railroad) **expansion project**, advising the Chairman of SNCF-I and acting as **Project Coordinator** for the Landbridge and MMRL projects (respectively freight

and passenger lines) and playing a key role at all stages of these complex projects. At the same time, he has been providing expert input for Keolis, a subsidiary of SNCF, in connection with international developments in Kent (UK), Sweden and Germany.

For a six-month period in 2004, he was **Technical Advisor** to **Korail** (Korean Railroads) in relation to high-speed operations, marketing and rolling stock strategy.

From April 1997 to mid-2004 Jean-Marie held the position of **Chief Executive Officer** at **Télécom Développement**, a subsidiary of SNCF and Cegetel (51% SNCF) and France's second long distance carrier, securing its profitability from 2000. This followed a period (1995-1997) working for the same company as **Chairman and Chief Executive Officer**, when it was 100 % owned by SNCF in the wake of its creation as a spin-off of SNCF's railroad telecom activities. It was during this period that Jean-Marie was involved in negotiations with regulatory bodies and potential partners.

From 1993-1994, Jean-Marie Metzler was **Director of International Passenger Distribution Systems** at SNCF spearheading its Distribution, Sales and Reservations partnerships. He was also Chairman of the SNCF "Grandes Lignes Internationales" holding company, which was responsible for international operation and distribution Joint Ventures. At the same time he acted as part-time **Technical Advisor** to **Ferrovie dello Stato** (Italian Railroads) for their passenger sector business.

Between 1987 and 1993, Jean-Marie was **Executive Vice-President Long Distance Passenger Business** (strategy, marketing sales, organization) at SNCF. In this position, he was in charge of managing 12,000 train conductors and 6,000 sales agents (SNCF & travel agents): training, IT tools. He was also involved in the commissioning of the Atlantic high-speed

train, the North TGV and in preparations for Eurostar and Thalys.

He introduced a brand new sales and pricing policy, based on the yield management principle, together with the corresponding software, adapted from the Sabre system used by American Airlines. Internationally he chaired the **Price Committee** of the **International Union of Railways** (UIC), where his role related primarily to negotiations with the European Commission over the deregulation of the Travel Agency sector.

Jean-Marie Metzler also worked for several years for the **Schneider Group**. From 1983 to 1987, he was **President of MTE** (rolling stock engineering), **Executive Vice President of Jeumont-Schneider** (railroad branch), **Board member** of the **EIG Francorail-MTE** (Jeumont-Schneider, ANF), **Chairman of Carel et Fouché**, **CEO of Schneider-Creusot-Rail** (500 persons, in charge in particular of TGV bogies).

This was preceded by two years in the **SNCF Operations Department** as **Deputy Director for Technical Studies and Investments** and five years (1976-1981) in its **Rolling Stock Department** as **Project Manager** for the first generation of TGV (high-speed) rolling stock (construction, acceptance tests, commissioning). Between 1974 and 1976, Jean-Marie was **Head of the Maintenance Department for Locomotives and EMU's** and, between 1972 and 1974, **Manager of the Maintenance Works** (diesel locomotives) at Sotteville les Rouen.

His earliest posts at SNCF were as **Deputy Area Manager "Operations"** (passenger and freight) for the Lorraine region (1970-



1972) and as **Manager of the Locomotive**

Depot in Strasbourg (1968-1969).



Frank BERNARD

PROFILE

Frank Bernard (48) graduated from the Ecole Supérieure de Commerce (Business School) in Paris, in 1985. Since then he has pursued a career, initially in finance and subsequently in management, in a number of private sector companies before entering the railroad industry some 10 years ago.

Frank has earned himself a well-deserved reputation as a skilled manager capable of driving company results, spearheading financial restructuring and boosting market share. He is also an experienced negotiator at the highest level. In addition to his native French, he speaks fluent English and has some knowledge of German and Dutch.

AREAS OF EXPERTISE & EXPERIENCE

Since 2007, Frank Bernard has been **Director, Europe and Business Development** at **Voyageurs France Europe** (VFE), a branch of French Railroads (SNCF). VFE has a number of subsidiaries, the seven most important of which are Eurostar, Thalys, Alleo, Lyria, Artesia, Elipsos and NTV. In 2008, these subsidiaries handled 21 million passengers for sales revenues amounting to € 1.6 billion (\$ 2.25 billion). His key achievements in this post to date include the launch of the East European high-speed train with Germany (in association with German Railroads -

Deutsche Bahn) and Switzerland (with Swiss Railroads - CFF), restructuring the Eurostar Group's financial structures (negotiations with the UK Department of Transport), and acquisition of a stake in NTV, the first private European railroad operator (high-speed rail services on the Italian market).

Since November 2006 Frank has also been a Board Member of 12 of the SNCF Group subsidiaries, chairing three of the companies concerned.



Before taking up his present position, Frank was **General Manager** of **TGV France**, a branch of VFE, between January 2004 and October 2006. During this period sales rose by 25% to reach € 3.2 billion in 2006

(approx.\$ 4.5 billion) and EBIT doubled, rival airline services and iDTGV, the subsidiary of TGV France, was successfully launched in 2005. TGV France operates a fleet of nearly 500 trainsets.

From March 2002 to December 2003, Frank Bernard was **CEO** of **THALYS International**, a Brussels-based joint subsidiary of the French, Belgian, German and Dutch Railroads operating a fleet of 27 international trainsets, carrying 6 million passengers for sales amounting to € 320 million (approx. \$ 450 billion) in 2004. Under Frank's leadership a number of major changes were introduced, for example new fare structures, yield management and loyalty program. Thalys was the first rail service in Europe to launch ticketless travel and Internet on board its trains. Frank also successfully masterminded the restructuring of the company amid general market downturn.

Between April 1999 and February 2002, Frank was **Chief Financial Officer** of **Grandes Lignes**, SNCF's Long-Distance Passenger Traffic Division. There he was responsible for setting up the Finance Department and for first introducing ERP (SAP) within SNCF Group.

market share rose in relation to This followed a period between October 1994 and March 1999, in which Frank was Business Controller for a division of the **PINAULT PRINTEMPS REDOUTE Group** (€ 500 million turnover). In this capacity, his responsibilities consisted of reorganizing Group management control structures, merging different branches and ensuring financial recovery of subsidiaries in Morocco and elsewhere in Africa.

From June 1989 to September 1994, Frank was **Chief Financial Officer** of **Wang France**, a subsidiary of Wang Labs in the USA, and **Business Controller for Southern Europe**. His role included a number of restructuring exercises for renewed or greater profitability.

Frank has also worked in the airline industry. From September 1985 to May 1989 he was first **Budget Controller** and then **Business Controller** at **AIR INTER** (nowadays a division of Air France), where he was in charge of optimizing airport organization and controlling cargo activities. He has also worked at **HP**, **Les Editions Mondiales** and **KPMG**.



Pascal LUPO

PROFILE

Pascal LUPO (54) is currently Director of International Development and Chairman/CEO of **SNCF International**. He, is a graduate of both the Ecole Polytechnique (1973) and the Ecole Nationale des Ponts et Chaussées (1978).

In the course of his career to date, Pascal has used his civil engineering background and qualifications to develop a wide range of managerial skills and competencies, which are invaluable to him in his present position

and will give him broad insight into many of the different aspects of the current project. In addition, he can boast extensive international experience, having participated in assignments in countries such as Taiwan and Romania on behalf of Sofrérail. He is also member of the Board of Eurostazioni in Italy.

In addition to French, his mother tongue, Pascal speaks English and Italian.

AREAS OF EXPERTISE & EXPERIENCE

From September 2000 to March 2009, Pascal Lupo was **Director, Stations and Interchanges** at **French National Railroads (SNCF)**. His role consisted of organizing the station business sector, establishing general policy, scheduling refurbishment operations in key stations and

developing investment (up to EUR 150 million per year). He was responsible for developing a business model in line with European Directives and based on contractual relations with carriers. He also masterminded a customer service campaign involving the whole team of 7,500 SNCF

station employees, the main result of which has been the certification of services in 60 of France's biggest stations.

Pascal Lupo was the driving force behind the new policy developed and implemented by SNCF to enhance retail sales activities in stations and, more generally, exploit station property facilities. He was also behind the program of station adaptations geared towards improving station accessibility for passengers with disabilities.

Outside the purely French context, he was one of the founders of the Special "Stations" Group at the International Union of Railways (UIC), which staged, Next Station, an international conference on the subject in December 2007.

Since October 2000, he has also been the **Chairman** and CEO of the company **A2C**, which lets space in stations to retail and other businesses.

Between 1997 and 2000 Pascal Lupo was **Manager of the Paris Nord Region** for SNCF heading an 11,000-strong team responsible for developing and expanding products and services (Eurostar, Thalys, clockface services between Paris and Lille, Transilien [Paris suburban] services). During this period, he was also in charge of reorganizing and upgrading a classification yard in the region and for line electrification and modernization operations.

Manager for the **Amiens Region** from 1994 to 1997, with his 4,000-strong team Pascal was a prime-mover in efforts to build up regional traffic and traffic with the capital in cooperation with the local authorities and politicians. Under his leadership, the rolling stock sheds at Tergnier obtained their ISO certification and regional structures were radically reorganized for greater efficiency and performance.

Pascal's experience includes a five-year period as **Head of the Organization Department** (1989-1994), where he masterminded the transition to a business-led approach at SNCF and set up the Main-line Passenger and Freight transportation units. This was preceded by a year working in the **Chairman's Office** as part of the team in charge of auditing its operation and conducting strategic studies in preparation for governmental contractual plans.

Earlier he spent 3 years in the **Human Resources Department** designing new pay structures and innovative managerial systems.

On first entering SNCF, Pascal was employed between 1978 and 1985 in the **Civil Engineering Department**, where he gained experience in a wide number of fields, including maintenance of way, power supply and signaling systems, buildings and structures, in each case working with groups of 40 to 1,000 people



Dominique THILLAUD

PROFILE

Dominique Thillaud (40) is a graduate of the ISC (Institut Supérieur de Commerce) School of Management in Paris (1991) and holds a Master's degree from the Lyons Business School (1992).

Dominique's career has always been in Finance. He worked for Management Consultants and in Global Financial Services before joining French Railroads (SNCF) in 2002, where he has since

occupied a number of successively more important senior management positions.

Since July 2008, Dominique has been Director of Corporate Investment and Development Strategy, and it is in this capacity that he is a member of the Steering Committee responsible for overseeing SNCF proposals in conjunction with US initiatives, alongside **Pascal Lupo** and **Frank Bernard**.

AREAS OF EXPERTISE & EXPERIENCE

Dominique Thillaud embarked on his career in 1992, when he entered the employment of BNP (Banexi) in 1992 in Brussels as a merger-acquisitions analyst.

Two years later, he moved to the Corporate Finance Division of Price Whitehouse to take up a position as a privatization expert and governmental advisor. He remained there until 1997, when he transferred to JP Morgan Chase & Co in Paris and the position of Vice-President Mergers and Acquisitions.

It was in December 2002 that he first entered SNCF, joining *SNCF Participations*, the holding company for all SNCF Group subsidiaries, as Director

of Operations. Shortly after, in July 2003, he was named Director, SNCF Subsidiaries and Shareholdings and Deputy CEO of *SNCF Participations*, a position he occupied until March 2004, when he became Executive CEO. In this capacity, he began by focusing on a thorough reorganization of all SNCF stakeholdings, a process resulting, in particular, in disinvestment in a number of non-core activities and in capital restructuring of the Keolis and Ermewa Groups. In 2007, he launched an ambitious process of consolidation and external growth in line with the development strategy of SNCF, involving high-profile operations such as the take-over of logistics company Geodis, the acquisition



of German freight operator ITL, the Italian high speed rail operator NTV or IBM Logistics, and financial restructuring at Eurostar.

Dominique has also been a Board Member of 7 of the SNCF Group subsidiaries.

Since July 2008, Dominique has also occupied the position of Director, SNCF Corporate Investment and Development Strategy. His role in this capacity is to mastermind and orchestrate Group development strategy, coordinating all SNCF financial commitments and industrial investments for the Group as a whole.

APPENDIX 2. Environmental Issues and mitigation strategies

Impact	Main measures during the design and construction phases	Main measures during the operation and maintenance phases
PHYSICAL ENVIRONMENT		
Movements of materials (excavation, embankments)	<ul style="list-style-type: none"> • Re-use of materials or identification of dump sites. 	NA.
Interference with the flow of subsurface water and flood plains	<ul style="list-style-type: none"> • Inventory of springs and water catchment areas, piezometric controls, • Maintaining flow continuity, • Specific measures for flood plains. 	<ul style="list-style-type: none"> • Water collection, • Water regulation systems (retention basins), • Specific measures for flood plains, • Measures for preserving the volume of subsurface water bodies, etc.
Impact on the quality of surface and subsurface water	<ul style="list-style-type: none"> • Preventive measures (water collection and drainage by means of settling basins prior to discharge, storage of polluting products and materials, inspections, etc.), • Remedial measures (depollution). 	

NATURAL ENVIRONMENT		
Operations, bases, footpaths and worksite access	<ul style="list-style-type: none"> • Worksite organization (site boundaries, protection systems, signposting, etc.), • Installation of works bases, • Allowance for vulnerable sites when choosing the sites for bases, footpaths and worksite access, • Work site supervision • Ecological rehabilitation after works completion, etc. 	NA.
Infrastructure boundaries and operation	<ul style="list-style-type: none"> • Avoidance of unnecessary clearing • Boundaries and signposting. 	<ul style="list-style-type: none"> • Replanting, boundary reconstitution, slope rehabilitation • Measures to prevent accidental pollution • Passageways for large wild animals, etc.
Property adaptation	NA	Compensatory measures: planting hedges, provisions for small wild animals, etc.
Storage of embankment and cutting materials	Allowance for vulnerable sites when choosing storage areas.	Relocation of protected species.

HUMAN ENVIRONMENT		
Operations, bases, footpaths and worksite access	<ul style="list-style-type: none"> • Re-establishment of accesses, compliance with working schedules, • Protection systems • Restoration after works completion. 	NA
Effects on land ownership	NA	Compensation.
Change of land use	NA	Adaptation of land use documents.
Economic activities	Compensation MOU, temporary accesses and services, etc.	Compensation for permanent loss of land.
Interception of networks and easements	<ul style="list-style-type: none"> • Establishment of an access and routing plan, • User information, etc. 	<ul style="list-style-type: none"> • Water protection measures, network restoration, • Respect of easements.
Vibrations	<ul style="list-style-type: none"> • Utilization of suitable equipment, • Temporary evacuation of the neighboring population, etc. • Avoidance of vibration-sensitive areas, • Utilization of alternative equipment, • Specific precautions • Measurements and controls during the works. 	<ul style="list-style-type: none"> • Prior assessment of buildings, • Installation of protective devices (mats, resilient pads etc.), • Creation of sloped embankments by building up layers of increasingly large materials

HUMAN ENVIRONMENT		
Noise	<ul style="list-style-type: none"> • Adapting to local patterns • Avoiding work at night or on weekends • Use of suitably adapted, sound-proofed machines and equipment • Temporary protection around noisy work sites - hydraulic and other crushers (protection barriers or walls) • Organizing site movements using surrounding roadways (avoidance of quiet areas) 	<ul style="list-style-type: none"> • Installation of protective devices (walls, barriers and facade covers) • These protective devices should be designed to blend with their environment • Their effectiveness must be checked during the operating phase • Avoiding noisy maintenance operations at night and on weekends (or informing those living in the vicinity to avoid complaints)
Living environment	<ul style="list-style-type: none"> • Work site noise • Road traffic flows 	<ul style="list-style-type: none"> • Property reorganization • Visual and noise barriers, etc.
Operations, bases, footpaths and worksite access	<ul style="list-style-type: none"> • Compensation MOU, • Temporary access to agricultural parcels, • Temporary drainage systems, • Barriers. 	NA.
Sections of line near agricultural zones	<ul style="list-style-type: none"> • Setting of boundaries • Return to normal after works completion. 	<ul style="list-style-type: none"> • Property adaptation, • Compensation MOU, • Reconversion of surplus land for agriculture, • Drainage, etc.

HUMAN ENVIRONMENT		
Sections of line near forestry zones	<ul style="list-style-type: none"> • Compensation MOU, • Temporary access, • Watering, setting of boundaries, etc. 	<ul style="list-style-type: none"> • New plantings, • Plans for path restoration • Procedures connected with clearing, etc.
Impact	Main measures during the design and construction phases	Main measures during the operation and maintenance phases

HERITAGE, TOURISM AND LEISURE ACTIVITIES		
Archaeology	Preventive archaeological measures.	Preliminary investigations on the sites.
Sections of line near national heritage sites	Expert inspection of buildings within 150 m, landscaping.	<ul style="list-style-type: none"> • Preliminary investigations on the sites, • Compensation, • Landscaping, etc.
Footpath interception	Temporary access and measures for user safety	<ul style="list-style-type: none"> • Plans for path restoration, • Landscaping.
Sections near tourist sites and leisure facilities	<ul style="list-style-type: none"> • Temporary access points, • User information, safety measures, • Compensation schemes, • Compliance with the rules governing worksite organization 	<ul style="list-style-type: none"> • Landscaping, • Path restoration.

LANDSCAPE		
<u>Direct impact</u> Excess materials, cuttings / excavation Noise barriers Road restoration Bridges & tunnels Installations (sub-stations...) Retention and hydraulic basins	<ul style="list-style-type: none"> • Landscaping models • Work on the longitudinal profiles and cross sections • Architectural and earthworks interface • Civil engineering interface (longitudinal profile, landscaping, bridges & tunnels) • Architectural interface and attention-catching features (models) • Localization • Models and plans for restoration to normal condition 	<ul style="list-style-type: none"> • Agricultural reconstitution & replanting • Plantings, green swathe • Planting operations to ensure integration into site • Green swathe (plantings) • Green swathe (plantings) • Green swathe • Re-vegetation and ecological engineering
<u>Temporary impact</u> Footpaths and work site access Works bases Temporary stock yards <u>Generated impact</u> Waste land Property management	<ul style="list-style-type: none"> • Work on the permanent road network • Re-qualification after completion of the works • Protective measures and management of the topsoil • Land and management mode • Maintenance definition and planning 	<ul style="list-style-type: none"> • Green swathe (associated plantings) • Plantings, preparations for replanting or return to agricultural use • Re-use of topsoil • Plantings and involvement of local players • Management plan



APPENDIX 3. Traffic forecasts for a railroad project

This appendix gives details of the methods used by SNCF for the past 30 years in forecasting traffic and market share. It describes how the choices of potential clients can be identified (stated preferences) and provides a definition of the notions of generalized cost, value of time and utility. Some typical examples are also included by way of illustration.

I. Customers and their "stated preferences"

Anyone planning to develop new transportation infrastructure is naturally bound to wonder what motivates consumers to opt for auto, train or plane for any given journey. Each of us has our own ideas on the subject and each consumer makes his or her own decisions.

Conjoint analysis (or stated preferences) methods may be used to:

- ◆ identify and then categorize the different factors that explain modal choice in strict order of importance,
- ◆ determine the median of users' Value of Time (VOT) (for the mode concerned), used in traffic forecasts model.

The method consists of first identifying the quality factors that govern modal choice by means of qualitative surveys often conducted in the form of focus groups. These are a type of semi-directive collective interview. By way of example, this type of survey can be used in specific cases to establish journey time and price considerations, but will also provide insight into the importance of factors such as the convenience of obtaining a ticket, safety, travel comfort, frequency of service, etc. These criteria are then classified according to their importance and their relative weight.

The relative weight of each of these parameters is then introduced into a variety of scenarios to be put to one or several panels to determine the modal choice. Statistical processing is used to work out the most likely, or more precisely, the best scenarios especially as regards the price/journey time factors.

The parameters identified to explain travel motivation can then be used as input for quantified simulations of these scenarios as described in paragraph IV, economic assessment.

It is during this phase that it is also possible to make a first estimation of the median (m) of the value of passenger time (VoT) for the market (mode) under consideration. It should be noted that there exists a simple relationship between the mean M and median m, via the standard deviation σ , provided the fact that the statistical law of concerned population revenue is "log normal", which is the case worldwide as stated hereafter:

$$M = m * \exp(\sigma^2/2)$$

These values come into play in traffic forecast calculations, as will be seen later in Part III.

Limits of the results obtained in this phase: as indicated by the title of the paragraph, it is "stated preferences" that are at stake at this stage and not the results of marketing operations. In fact, there is always a difference, which may be quite large; between consumers' stated preferences and the way they behave in reality, despite statistical processing to "correct" any bias in the panel samples.

As made clear in the above introduction, where prices are concerned, there is no way that fares or scales of rates can be established solely on the basis of stated preferences.

Price ranges must of necessity be flexible and adapted to the commercial policy selected (volumes or ROI, for example), the economic situation, and will therefore vary over time.

Studies of this type are not part of the job of drawing up forecasts and therefore not covered by the methods described here. These latter are geared towards ascertaining market



receptiveness to the proposed new mode of transportation in order to be able to produce simulation scenarios.

II. General notions: observed traffic, generalized cost and utility

II.1. Observed traffic:

Traffic for a given mode of transportation, T_{ij} between two urban areas or, more generally, between two economic clusters i and j universally obeys a gravity-type law:

$$T_{ij} = k [P_i^a * P_j^b] / C_g^\alpha$$

Where: P_i and P_j the populations of the urban areas (corrected values for the income of the populations concerned), $a, b \neq 0.8$

$$1.8 < \alpha < 2.2$$

C_g is the generalized cost of the mode of transportation under consideration.

C_g is the general form $p + h * t$, p price of the mode considered, h the value of time for the users of this mode, t the journey time.

The values p and t are “generalized” values, in other words they allow for all price and journey time components (including, for example, access, waiting time etc.). This model is therefore of the so-called “gravity” type and is used, as we shall see later, for estimating newly generated traffic potential.

II.2. Generalized cost

The generalized cost is expressed by means of a general formula $C_g = P + h * T$, or to be more precise, for example:

$$C_g = (P_j + P_a) + h * (T_j + T_a)$$

where:

P_j is the price of the journey,

P_a the cost of access to the transportation mode (price of public or private transportation or even the cost of auto parking),

T_a journey time

T_j access time (including waiting time, which in turn makes it necessary to take account of the frequency of service of the particular mode, for example in the case of clockface services with departures at intervals F , by means of a formula such as: waiting time = number of operating hours / $(F-1)$).

The formula more generally used is:

$$C_g = P_g + h * T_g,$$

Where g stands for “generalized” in the sense that not only the price or mean journey time of the mode under study are involved but also all the other orders of magnitude relative to the trip.

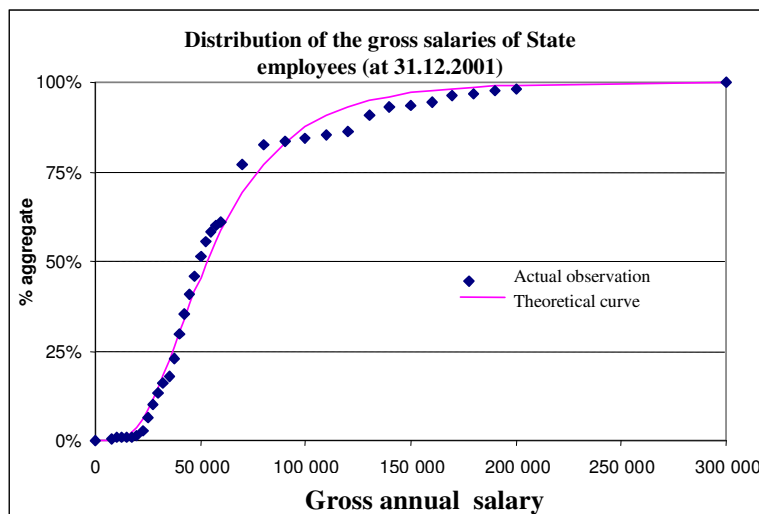
II.3. Value of time:

Reverting to the formula $T_{ij} = k [P_i^a * P_j^b] / C_g^\alpha$, T_{ij} can be identified from observation, as can P_i and P_j , whereas p_g and t_g can be established and the values a , b and α calibrated using a Gaussian regression model. The mean value h of time for the use of the mode concerned is determined by statistical regression for each observation.

The mean value h of time is in fact the result of a random variable, the distribution of which is linked to the income and wealth of the population considered. In general, the tendency is more towards using income as a basis rather than wealth, although some clients apply a mixture of the two depending on the reasons for their journey.

For a passenger, the value of time represents the sum of money that he is prepared to pay to save an hour of his time. Ordinarily we consider that this value of time is proportional to a passenger's disposable income or the amount he earns per hour and for this we have recourse to the official income distribution statistics as a means of working out the distribution of the value of time.

By way of example, we shall start by quoting the case of Morocco, where traffic studies of the type described in this document have been carried out. As shown in the graph, the distribution of salaries among State employees follows a log-normal pattern.

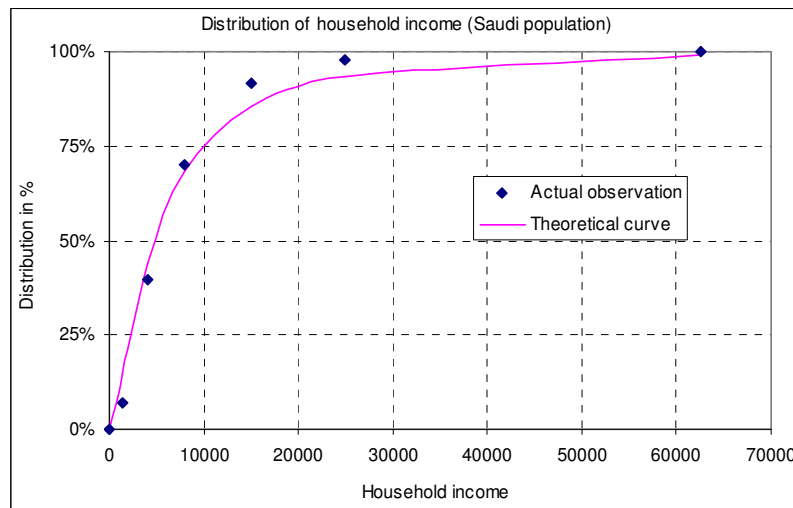


The gross annual average salary is 61,872 MAD and the median salary (50% of employees earn less and 50% earn more) is 53,187 MAD. The standard deviation of the calibrated distribution is 0.55 (which should not be confused with the standard deviation for the distribution of income or of the value of time, which ranges between 1.1 and 1.6 as will be seen below when we come to the example of Saudi Arabia).

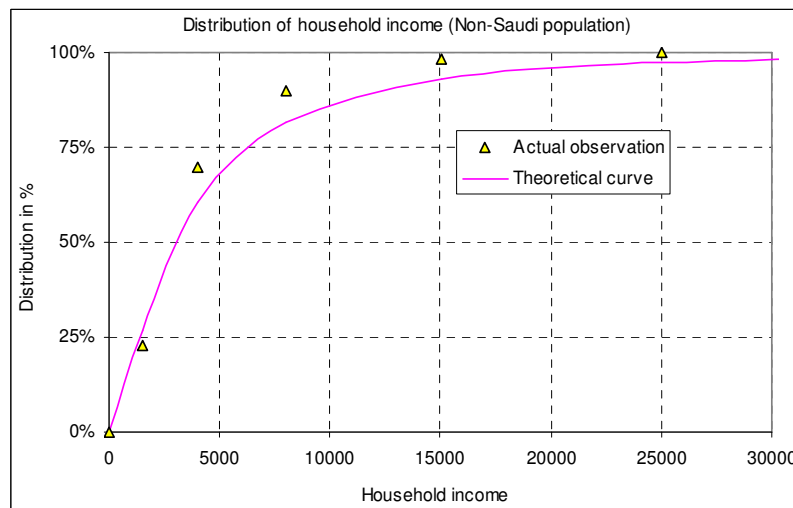
In the absence of data on the value of time, the mean hourly rate of pay has been taken directly for the value of time, i.e. approx. 30 MAD/h.

The following two graphs show the income distribution pattern for Saudi Arabia, our second example. This pattern is consistent with the theoretical "model" encountered all over the world.

The distribution pattern obeys a law that is so general that it is possible to affirm that, if another pattern were to be found in a given country by comparison with this theoretical model, the logical assumption would be that there had been an error in the data collection.



DISTRIBUTION OF HOUSEHOLD INCOME FOR SAUDI POPULATION



DISTRIBUTION OF HOUSEHOLD INCOME FOR NON SAUDI POPULATION

Therefore, the value (h) of time (VoT) for the consumers of a given mode is a probabilistic magnitude, a random variable in mathematics. It obeys a log-normal distribution pattern for the median m and standard dimension σ . From the median it is possible to deduce the mean, $M = m \cdot \exp(\sigma^2/2)$

is in the region of 1.1 to 1.3 or even 1.6 for some segments of the population; M varies depending on the mode of transportation used, since for an airline passenger the value of time is obviously not the same as for a bus passenger.

The law may be expressed as follows:

$$f(h) = \frac{1}{\sigma h \sqrt{2\pi}} \exp\left(-\frac{1}{2\sigma^2} (\ln(h) - \ln(m))^2\right)$$

where m and σ are parameters that are representative respectively of the median and the income distribution spread.

It should be noted that at this stage, we are dealing with “revealed preferences” and not “stated preferences”, since contrary to the previous paragraph, these are real observations of consumer behavior and not merely declarations of intent on the part of potential customers when faced with the theoretically possibility of a new product.

II.4. Utility:

Economic theory expresses the choice in favor of a given mode (m), the traffic T_m as the "utility" U of that mode on the basis of the relation:

$$T_m = k * e^{U_m}$$

Utility itself is in inverse proportion to the generalized cost of the mode, according to the formula:

$$U_m = C_g^{-\alpha}$$

Here the value of a user's time as seen above is the ratio of the Lagrange multipliers that maximize the utility U as a function of the generalized cost C_g , subject to the constraint:

$$C_g = P_g + h * T_g$$

It should be noted that in this case the cost envisaged is the modal cost for all its users, hence h is the mean of time value of all users.

The equation is $dU = 0$, i.e. $\partial U / \partial P * dP + \partial U / \partial T * dT = 0$

The variables, P and T , obey the condition in optimum fashion: $\lambda * P + \mu * T$ is an integrable form.

Mathematically the oscillating plane C_g (linking P and T) is therefore tangential to the surface of utility U .

III. Modal split, Probit and Logit and traffic shift models, gravity and newly generated (“induced”) traffic model

The modal split is established by applying the models to the rival modes in pairs, in other words in the case of a railway investment, to the competition between air and rail and then to that between road and rail. This latter may also in theory be split into competition between bus and rail and between auto and rail.

III.1. Probit model (lognormal distribution)

This model is well suited to **the case of rail/air competition**. Depending on the value they attach to time, passengers will choose from the modes at their disposal the one that offers them the lowest generalized cost according to the following general formula:

$$Cg_i = Px_i + h Tg_i$$

Cg_i is the generalized cost of the mode i with cost Px_i and journey time Tg_i for a passenger for whom the value of time is equal to h .

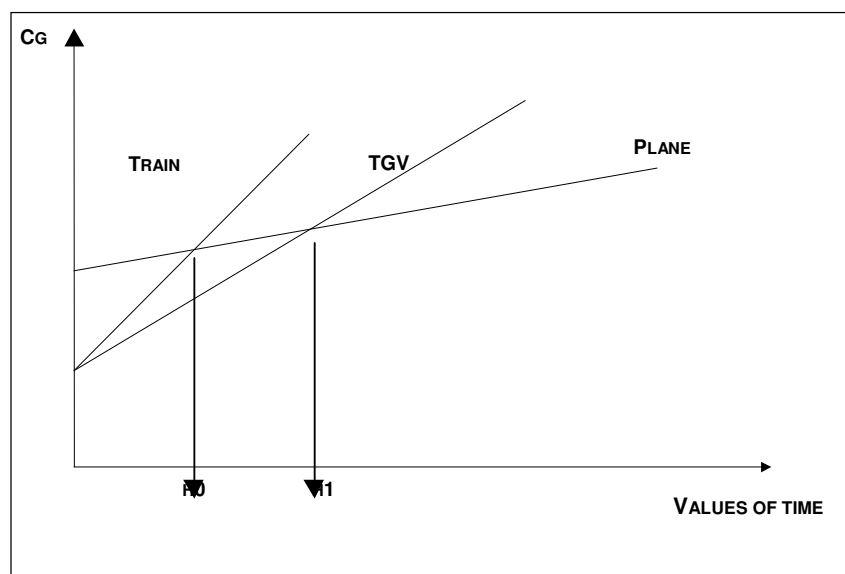
In the final analysis, this means that consumers make their choices on the basis of the value that they personally attach to their time.

If we take, for example, a case where the choice is between rail and air, with the train journey taking longer but costing less, these cost and time assumptions result in the following inequalities:

$$Tg_t > Tg_a \text{ and } Px_t < Px_a$$

If the generalized costs are represented as a function of the value of time h , there exists a value of time, h_0 , below which the passenger will choose to go by train and above which the same passenger will opt to travel by plane. h_0 is called the **indifference value of time**: $h_0 = (Px_a - Px_t)/(Tg_t - Tg_a)$

In the graph that follows it is clearly apparent that those for whom the value of time is less than h_0 opt for rail, in other words the mode which offers them the lowest generalized cost.



Choice modeling:

To identify the percentage of the population for whom the value of time is greater or smaller than h_0 , the following lognormal distribution law is applied:

$$f(h) = \frac{1}{\sigma h \sqrt{2\pi}} \exp\left(-\frac{1}{2\sigma^2} (\ln(h) - \ln(m))^2\right)$$

where: m is the median, σ the standard deviation, as established respectively by the stated preferences survey and the income distribution curve, h the VoT.

Traffic of mode (1) between origin i and destination j is therefore the integral:

$$S_1 = \text{Prob}(h < h_0) = \int_0^{h_0} f(h) dh$$

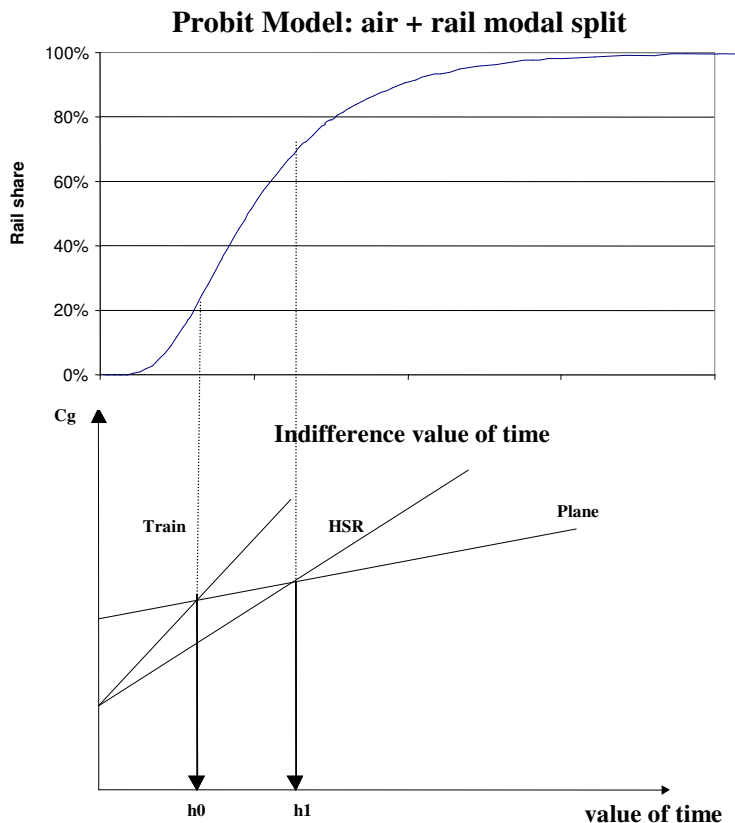
where h_0 is the **indifference value of time** for the two competing modes.

The share (“part”) of mode (2) is $S_2 = 1 - S_1$

The modal share obtained by rail will therefore be:

$$\text{Part train} = \text{Prob}(h < h_0) = \int_0^{h_0} \frac{1}{\sigma h \sqrt{2\pi}} \exp\left(-\frac{1}{2\sigma^2} (\ln(h) - \ln(m))^2\right) dh$$

and that of the air option: Part plane = 1 – Part train.



When a new rail service is commissioned, the pattern of supply changes and this, in turn, drives up the indifference value of time (h_1) in relation to the reference situation. Rail's share of traffic will increase. A proportion of those who went by air will change mode and will opt for rail instead under the new conditions created by the project. This enables us to obtain a forecast for the shift of traffic from one mode to the other.

III.1. Logit model (utility):

This model is well suited to **the case of rail/(bus & private auto) competition.**

In order to be able to predict the traffic that will transfer from private autos, the so-called logit model is therefore used. This works on the basis of the assumption that the choice between two transportation modes m and n depends on the utility ratio, in other words:

$$S_m = U_m / (U_m + U_n)$$

To say that modal split is governed by the utility ratio is always akin to saying that it is the value of time of the consumers of each mode that determines their choice, only this time it is via the generalized cost ratio of each mode.

The general form of the logit model is as follows:

$$Part_{ij}^{fer} = \frac{u(Cg_{ij}^{fer})}{\sum_m u(Cg_{ij}^m)}$$

where:

$Part_{ij}^{fer}$: share of rail+mode traffic between i and zone j

u : utility function of a mode

Cg_{ij}^{fer} : generalized cost of the rail mode between zone i and zone j

Cg_{ij}^m : generalized cost of a mode ' m ' between zone i and zone j

As has been seen above, the form of the utility function is as follows:

$$u_{ij}^m = e^{\gamma Cg_{ij}^m}$$

where:

u_{ij}^m = utility of the mode ' m ' on the route between zone i and zone j

Cg_{ij}^m = generalized cost of the mode ' m ' between zone i and zone j

γ = constant of the model

In general form this gives:

$$Part_{ij}^{fer} = \frac{a(Cg_{ij}^{fer})^\gamma}{a(Cg_{ij}^{fer})^\gamma + (Cg_{ij}^m)^\gamma} \text{ or } Part_{ij}^{fer} = \frac{a}{a + (\frac{Cg_{ij}^{fer}}{Cg_{ij}^m})^\gamma}$$

where:

a : constant of the model

This equation is transformed to give:

$$\ln(\frac{Traf_{ij}^{fer}}{Traf_{ij}^m}) = \gamma \ln(\frac{Cg_{ij}^{fer}}{Cg_{ij}^m}) + \ln(a)$$

The above linear form makes it easier to calibrate the model given from a statistical point of view.

The implementation of a railway project modifies the conditions of the services on offer and results in a drop in the generalized cost of the rail mode in relation to the reference situation. The share of rail traffic will increase. Part of the traffic using other modes will therefore change mode and go over to rail in the project situation.

If the following notions are taken into account:

$Traf_{ij0}^{fer}$: rail traffic between zone i and zone j in the reference situation

$Traf_{ij0}^m$: traffic 'm' between zone i and zone j in the reference situation

$Part_{ij0}^m$: share of traffic 'm' between zone i and zone j in the reference situation

$Part_{ij1}^m$: share of traffic 'm' between zone i and zone j with the implementation of the rail project (not including newly generated traffic)

$Traf_{ij1}^m$: traffic 'm' between zone i and zone j with the implementation of the rail project

Det_{ij}^m : shift of traffic 'm' between zone i and zone j

$TxDet_{ij}^m$: rate of shift of traffic 'm' between zone i and zone j

This gives:

$$Part_{ij0}^m = \frac{Traf_{ij0}^m}{Traf_{ij0}^{fer} + Traf_{ij0}^m}$$

Using the model the new share of traffic in mode 'm' $Part_{ij1}^m$ may be obtained. Traffic in mode 'm' with the railway project will therefore be as follows:

$$Traf_{ij0}^m = Part_{ij1}^m * (Traf_{ij0}^{fer} + Traf_{ij0}^m)$$

This gives the following shift in traffic to mode 'm' and rate of shift:

$$Det_{ij}^m = Traf_{ij0}^m - Traf_{ij1}^m$$

and

$$TxDet_{ij}^m = \frac{Det_{ij}^m}{Traf_{ij0}^m}$$

Another reason to use this type of model is the examination of the competition: a slower, more expensive mode can still hold on to a not unsubstantial market share (reflected by the "statistical remainders" from surveys and mathematical processing). On certain routes, SNCF has therefore been able to identify a number of consumers who remain faithful to their mode of transportation, be it auto, plane or train, whatever the service offered by rival modes.

This is particularly the case between autos and trains in some inter-city travel segments.

In such cases, the probit model can no longer be applied.

III.1. The gravity model (newly generated or "induced" traffic):

The implementation of a railway project modifies the conditions of the services on offer and results in a drop in the generalized cost of the rail mode in relation to the reference situation. In addition to users of mode m who change mode, traffic also emerges that would not have existed in the absence of this improvement. This is what is referred to as "newly generated (induced) traffic". Such traffic is calculated by means of a gravity model with the following general form:

$$Traf_{ij} = k \frac{f(\text{attraction factors})}{g(\text{repulsion factors})}$$

where:

- $Traf_{ij}$: traffic exchanged between i and zone j
- $f(\text{attraction factors}_{ij})$: function of the attraction factors between zone i and zone j
- $g(\text{repulsion factors}_{ij})$: f

unction of the repulsion factors between zone i and zone j

- k : constant of the model

The attraction factors are: population, GDP, mean salary and income, etc. The repulsion factors are the generalized costs calculated.

If population figures, employment and income are chosen as attraction factors, this gives the following gravity model formula:

$$Traf_{ij} = k \frac{((Pop_i + Emp_i) * (Pop_j + Emp_j)) * (Rev_i * Rev_j)^\alpha}{Cg_{ij}^\beta}$$

where:

- $Traf_{ij}$ = traffic exchanged between i and zone j
- Pop_i, Pop_j = populations of zone i and zone j

Emp_i, Emp_j = employment in zone i and zone j

Rev_i, Rev_j = income in zone i and zone j

Cg_{ij} = generalized cost between i and zone

α: elasticity of traffic in relation to population and wealth

β: elasticity of traffic in relation to generalized cost

k: constant of the model

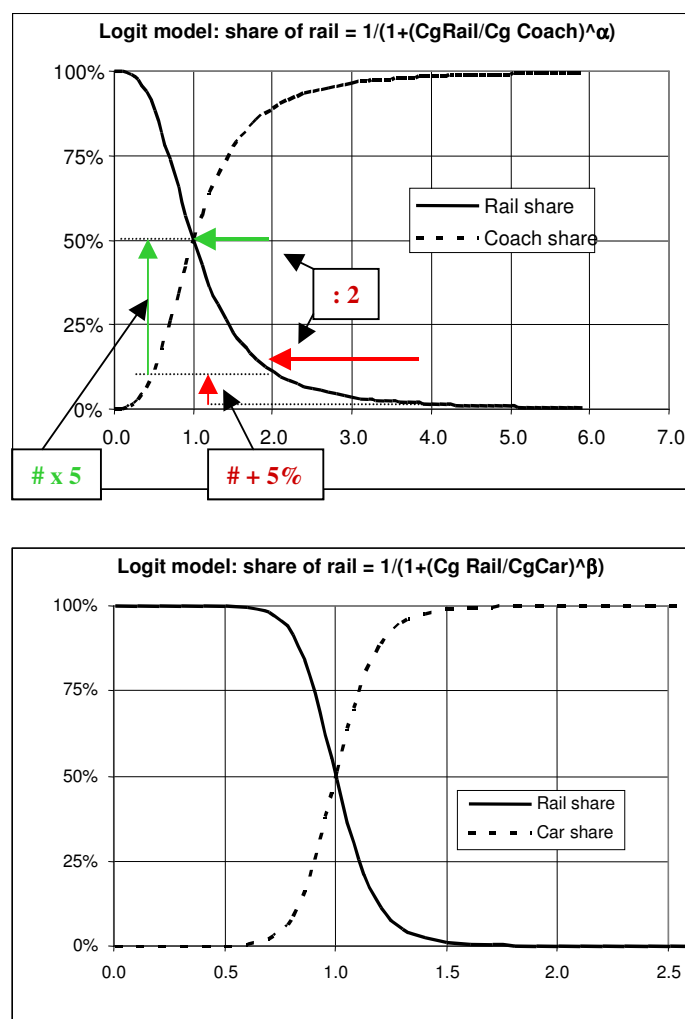
The implementation of a railway project modifies the conditions of the services on offer and results in a variation of the generalised cost $\delta C_{g_{ij}}$ in relation to the reference situation. The variation in traffic is linked to the variation of the generalised cost by means of the following formula:

$$\frac{\delta Traf_{ij}}{Traf_{ij}} = -\beta \frac{\delta C_{g_{ij}}}{C_{g_{ij}}}$$

IV. Interpreting the results and economic assessment

IV.1. Interpreting the results:

The following graphs show the results for the Logit model of the calculations of market share from the generalised cost ratio in two cases: rail/bus (coefficient in the formula referred to as α), and rail/auto (coefficient here called β) [Caution, these parameters are those of the bimodal model and not powers of the formula given above, $U_m = C_g - \alpha$]:

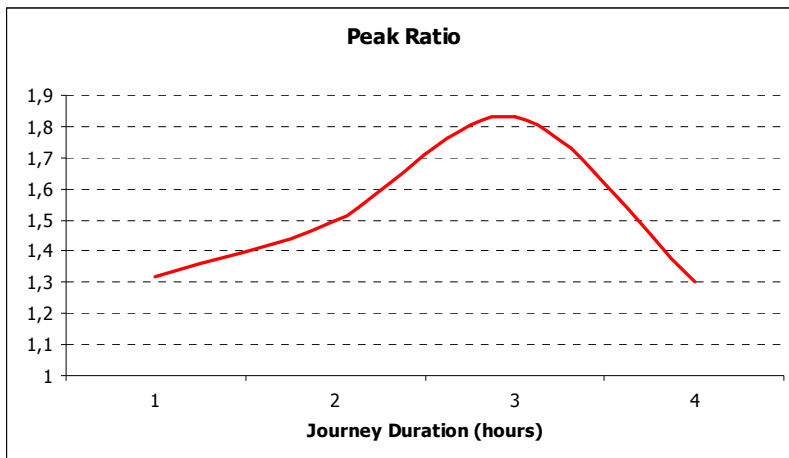


Analyzing these graphs shows that market share is indeed a function of the generalised cost ratio, and that the “TGV effect” is not constant for all of the coordinates of the ratios of these costs. In the first graph, for example, we can see that if the generalised cost of time is halved (i.e. that of a journey time of the same order of magnitude, since $C_g = P + h \cdot T$), this does not have the same effect at all depending on the cost ratio at the outset: a ratio that goes from 4 to

2 only changes rail's market share from 5 to 10% approximately (# 5%), whilst a drop in the ratio from 2 to 1 prompts a leap from 10 to 50% (x 5)!

In the place of these “final” market shares, it is also possible to express the same results as a “traffic shift rate”, in other words the proportion of the clients of one mode who go over to another mode. From this it is possible to have an idea of the effect of a given investment on consumer behavior.

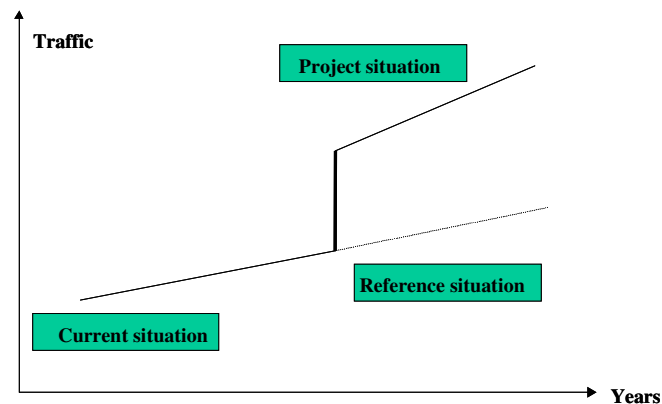
N.B.: Another example of non-linearity in the results for phenomena following a lognormal pattern is that of peak traffic (monthly or weekly). This also obeys the same type of law (assuming constant fares) as a function of journey duration, which gives the following graph:



For a journey that goes from 4 to 2 hours, the peak ratio remains constant, in other words there is no need to take any specific operating or fares measures. This is something that SNCF discovered following the launch of TGV services between Paris and Lyons. One wrong interpretation would be to say that the “peak has disappeared”. In fact it has stayed the same. By contrast, when journey times went from 4 to 3 hours on Paris-Bordeaux, the peak could have shifted from 1.35 to 1.8. Action therefore had to be taken at fares level to obviate the risk of insurmountable operating difficulties or costly extra investment in further rolling stock that would have been idle in normal operating periods.

IV.2. Economic assessment:

A project may be therefore assessed by comparing a so-called “reference” situation, which allows for the natural development of traffic without the investment proposed, with the traffic calculated by means of the methods described above. The rationale is shown in the following diagram:



Different prices and quality of service scenarios, each with their own corresponding generalised costs, may be considered in order to fine-tune the project and select possible alternatives, not only from a financial point of view but also from a social and economic perspective. For example, it is perfectly possible to opt for financial returns over traffic volumes or to target a predetermined journey time. It is also possible to try to identify the optimum speed or the maximum amount of investment to obtain a rate of return above a given level.

It is on this basis that SNCF pitched journey time at 2 hours for the Paris-Lyons project, at 3 hours for Paris-Bordeaux in the Atlantic TGV project and at 3 hours for Paris-Marseilles in the case of the Mediterranean TGV.



APPENDIX 4. Stations Locations

This appendix contains confidential information only available on request.



APPENDIX 5. Parking

This appendix contains confidential information only available on request.

APPENDIX 6. Station facilities

I. Stations services

Further detailed market studies (customer profile segmentation), ad hoc marketing and sales program, and traffic forecasts will serve as a basis for working out requirements in terms of space (for station operation and for carriers) and in terms of the volume and nature of the retail services to be provided.

TICKET OFFICES



In the case of US operations, the general use of virtual ticketing (combined with self-service machines for ticket exchanges or multi-operator vending machines) will also have a huge impact on the size of the areas to be reserved for ticket sales, but also for staff back-offices. In addition, the growing number of automatic vending machines of all kinds will require a new approach to spatial planning to achieve a consistent and understandable service offer.

Anyway, ticket offices are designed to

combine an attractive reception area for clients with an ergonomic workspace for staff.

PASSENGER INFORMATION

Decentralized, personalized and real-time train schedule information, and intermodalal information in and around the station are good ways of giving passengers scope for maximum mobility during their time in the station. Such information heightens their sense of security and improves their perception of the transportation process. Combining and supplying information from a variety of different public transportation providers is crucial in building customer confidence and, thus, encouraging people to use public transportation for their door-to-door journeys.

Moreover, for operators passenger information is a vital tool in their efficiency and productivity and enables them to cope with all unforeseen events.



INTERCHANGE SERVICES

Members of staff will bring a human touch to ease transfers through the station, offering personalized information, special care (with a focus on travelers with specific needs), and assistance with luggage, etc. Moreover, production team to ensure that trains are punctual, comfortable and function efficiently.

ASSISTANCE FOR DISABLED



Reception point specifically for those with disabilities at the entrance of the station



Specially trained teams to assist people with all kinds of disabilities.

WAITING AREAS WITH WI-FI ACCESS

Waiting areas have to be tailored to the amount of time spent by travelers before their train departure.

Moreover, today's stations accommodate passenger, information, and also data flows. Wi-Fi technology provides passengers and staff with the high bandwidth wireless access that they have come to expect in stations.

LEFT LUGGAGE

LUGGAGE ASSISTANCE

LOST PROPERTY

RESTROOMS



RETAIL OUTLETS

All stations propose fast-food / takeout catering, souvenirs and bookstores. But other kinds of stores (groceries, clothing and accessories, flowers, stationery, entertainment / leisure, etc.) will be provided in individual stations depending on their size, traffic, location (big or medium-sized city).



Bookstore



Take-out catering

SERVICES DEDICATED TO HIGH CONTRIBUTION TRAVELERS

Moreover, services dedicated to high contribution travelers (frequent traveler lounges, business centers, etc.) are pivotal in adding value to the customer, complementing the travel experience with a vast range of services (included in the price of the ticket or not). Many of these services (retail outlets, business centers, etc.) provide critical streams of ancillary revenue. Nevertheless, some of these can only be proposed in major stations.

Strasbourg Business Lounge



BUSINESS CENTER

In some stations, a business center close the station with offices, meeting rooms, practical facilities (secretariat, meals, office equipment, etc.) can be placed at company disposal for a specific duration.



Business Center in Paris Gare de Lyon station: outside and inside.



APPENDIX 6. Station facilities

II. Pax flow management

This appendix contains confidential information only available on request.

APPENDIX 7. Intermodal connections

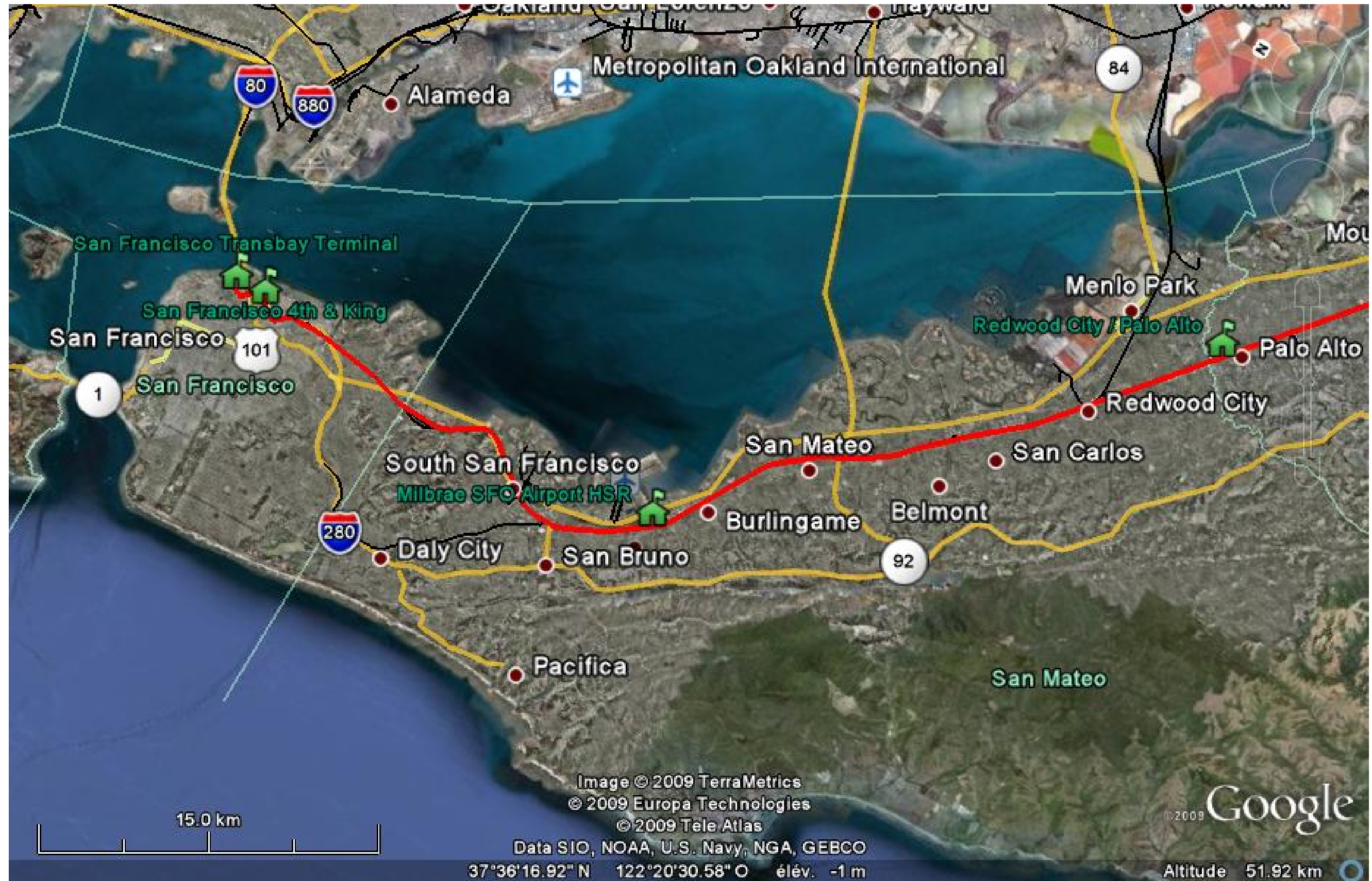
For each individual HSR station, SNCF will work to optimize interconnection with all the different transportation service operators. This will involve:

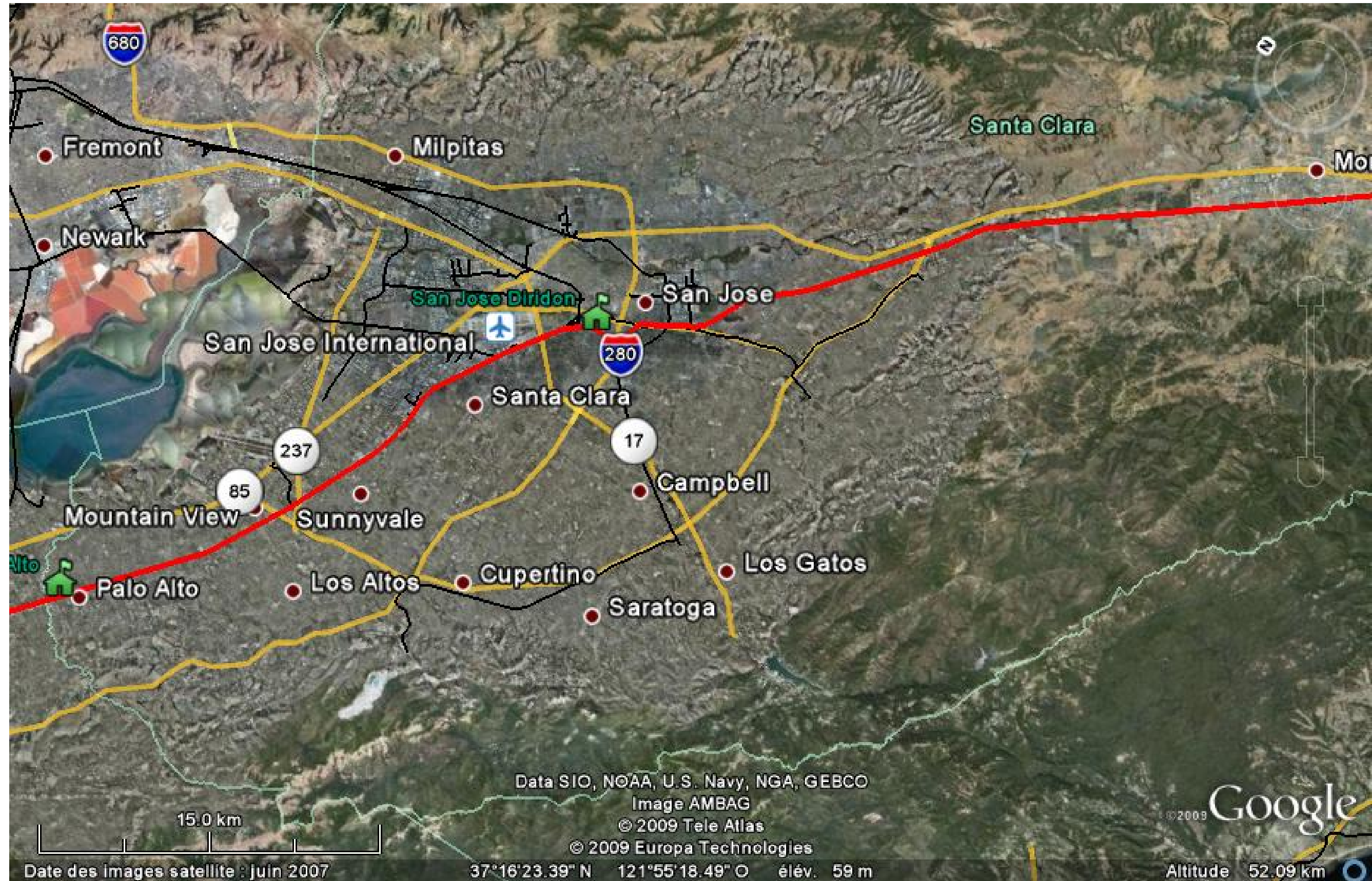
- Optimizing station layout to minimize walking distances
- Encouraging transit connectivity through coordinated scheduling and services
- Coordinating multimodal transit information
- Establishing agreements regarding management of downgraded situations
- Offering multimodal ticketing wherever possible

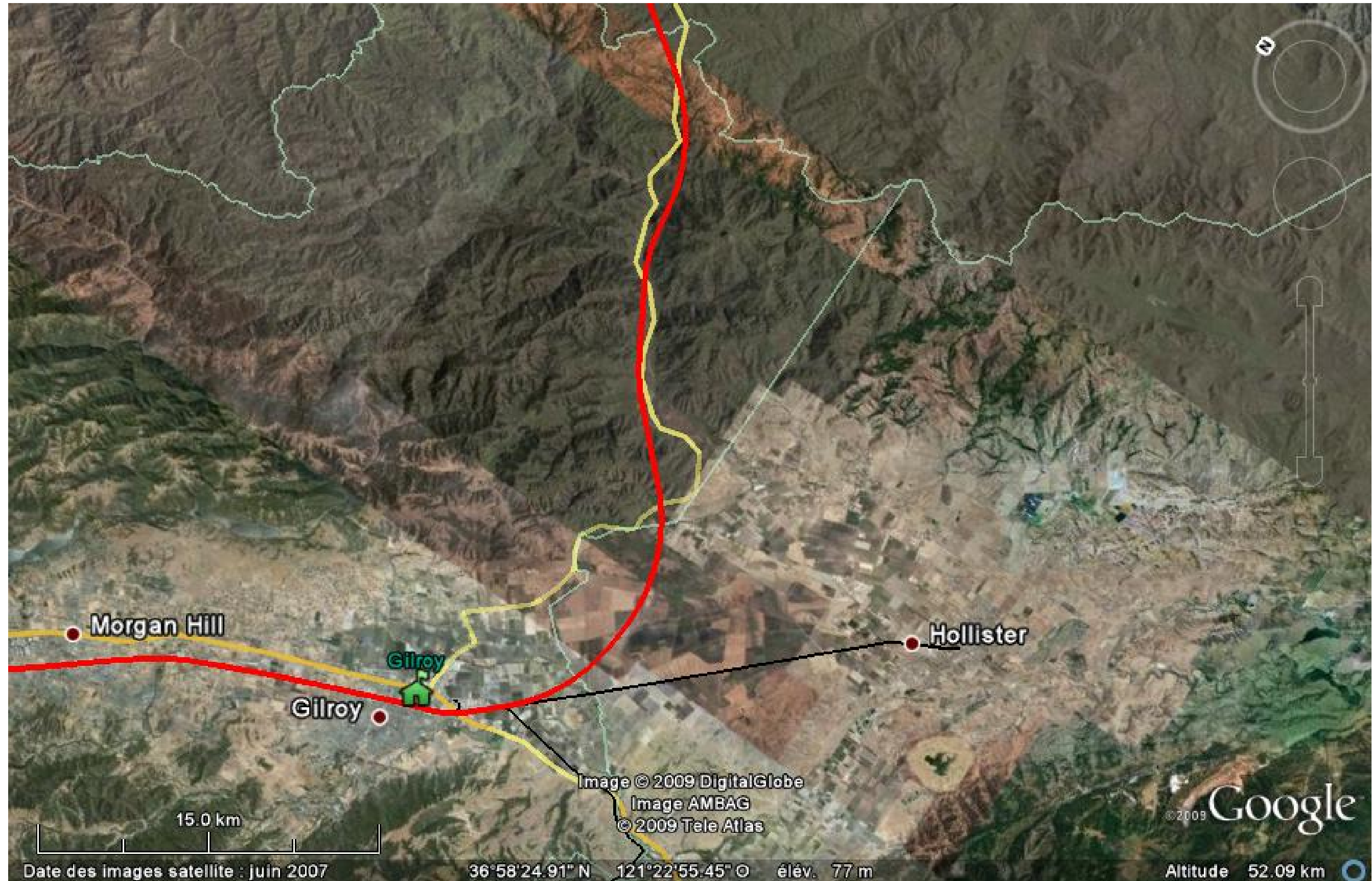
The matrix below lists some of the operators concerned for the different stations on the proposed California HSL.

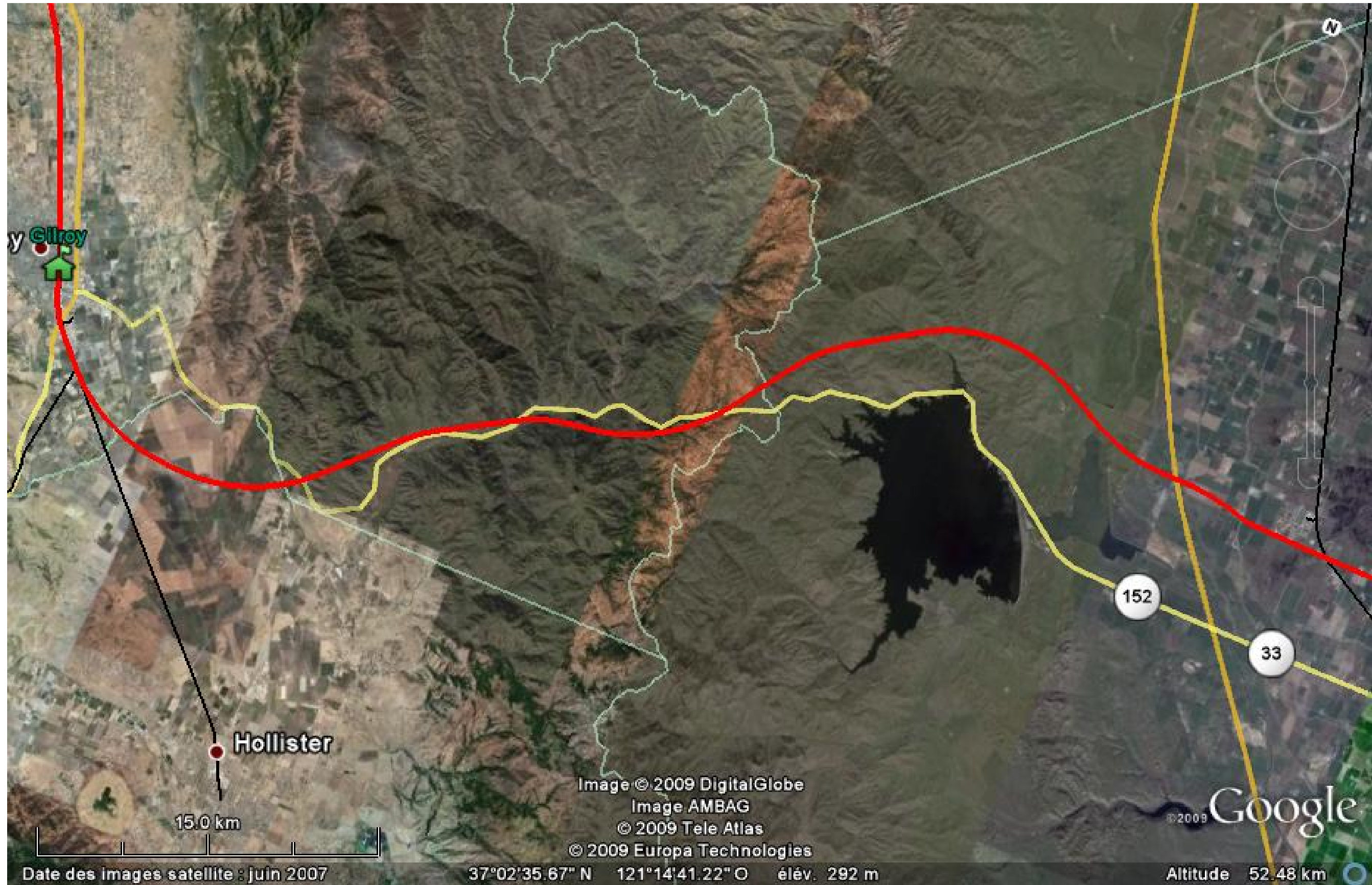
	Station data Million station pax / year (boarding + alighting)	Intermodal connections with HSR				
		Bus	Light rail	Subway	Local / Regional train	Long distance train
San Francisco Transbay Terminal	23.40	SFMTA www.sfmta.com	SFMTA www.sfmta.com	BART www.bart.gov	Caltrain www.caltrain.com	
San Francisco 4th and King St (Caltrain Terminal)	N/A	SFMTA www.sfmta.com	SFMTA www.sfmta.com		Caltrain www.caltrain.com	
Millbrae SFO Airport	2.36	SamTrans www.samtrans.com		BART www.bart.gov	Caltrain www.caltrain.com	
Redwood City (or Palo Alto)	4.03	SamTrans www.samtrans.com			Caltrain www.caltrain.com	
Palo Alto (or Redwood City)	4.03	SamTrans www.samtrans.com			Caltrain www.caltrain.com	
San Jose Diridon	10.68	VTA www.vta.org	VTA www.vta.org	BART (Project) www.bart.gov	Caltrain www.caltrain.com	Amtrak www.amtrak.com
		SCMTD www.scmt.com			ACE www.acerail.com	
		Amtrak www.amtrak.com			Capitol Corridor (Amtrak) www.capitolcorridor.org	
Gilroy	3.53	VTA www.vta.org			Caltrain www.caltrain.com	
		Amtrak www.amtrak.com				
Fresno	5.15	Fresno Area Express FAX www.fresno.gov				
Merced	1.28	YARTS www.yarts.com				
		THE BUS www.mercedthebus.com				
Bakersfield	6.42	Golden Empire Transit GET www.getbus.org				Amtrak www.amtrak.com
		Amtrak www.amtrak.com				
Palmdale PMD Airport	8.71	Antelope Valley Transit AVTA www.avta.com			Metrolink www.metrolinktrains.com	DesertXpress (Project) www.desertxpress.com
		City of Santa Clarita Bus www.santaclaritatransit.com				
		Greyhound www.greyhound.com				
Sylmar	11.36	Metro www.metro.net			Metrolink www.metrolinktrains.com	
Burbank	3.40	Metro www.metro.net			Metrolink www.metrolinktrains.com	
Los Angeles Union Station	16.25	Metro www.metro.net		Metro www.metro.net	Metrolink www.metrolinktrains.com	Amtrak www.amtrak.com
Norwalk	1.18	Metro www.metro.net			Metrolink www.metrolinktrains.com	
Anaheim ARTIC	6.21	Metro www.metro.net			Metrolink www.metrolinktrains.com	

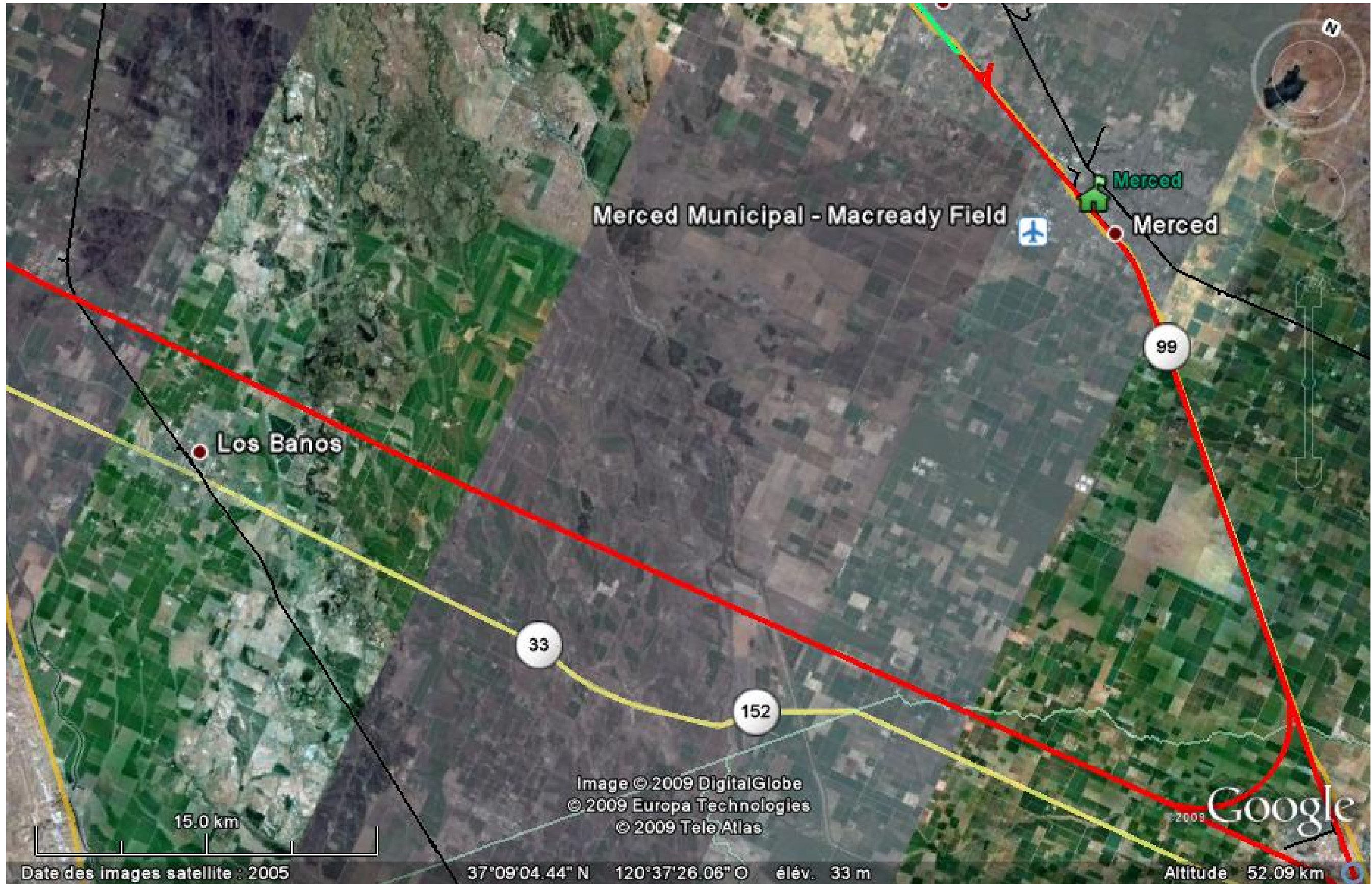
APPENDIX 8. Alignment Maps

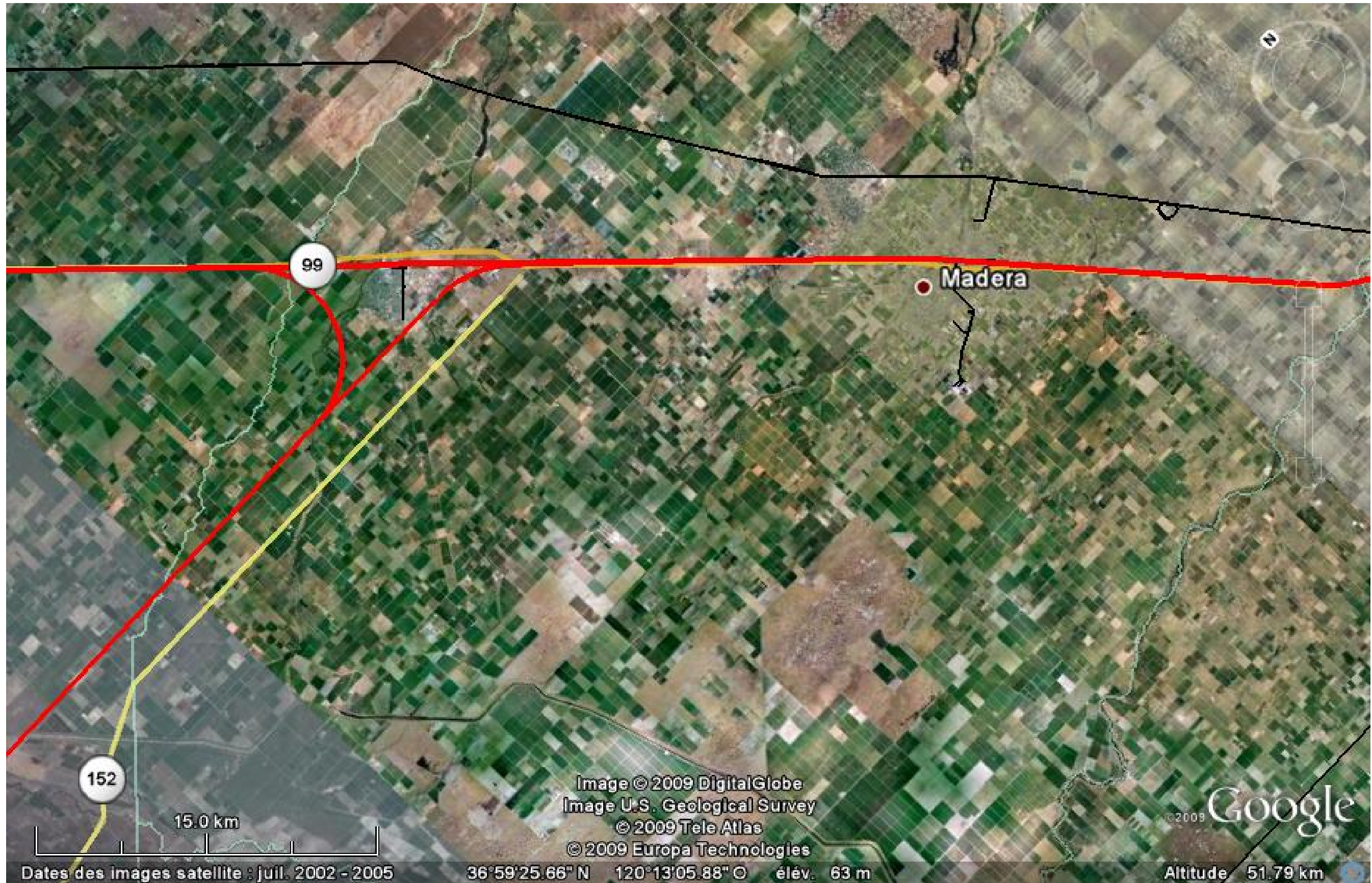


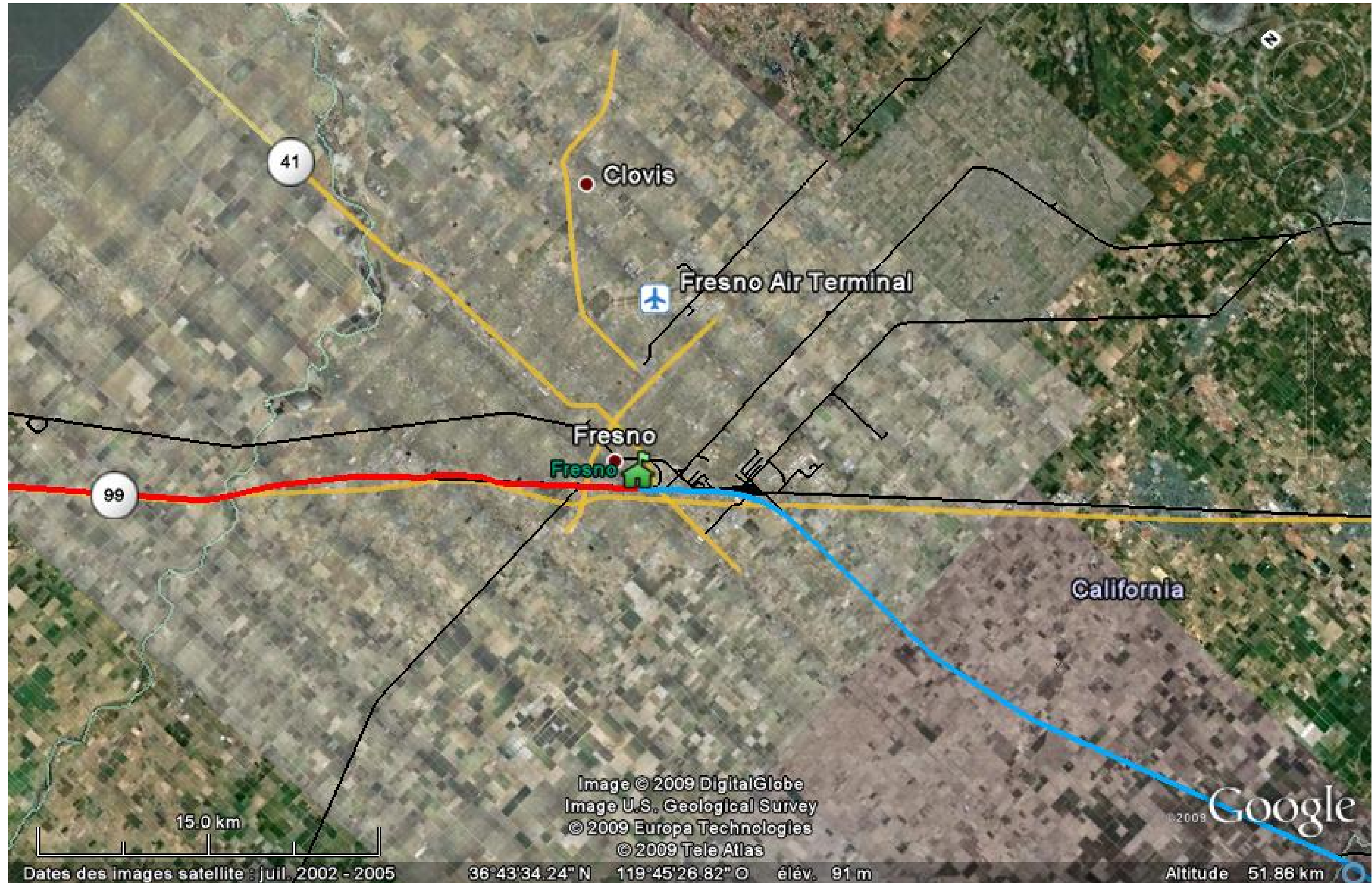


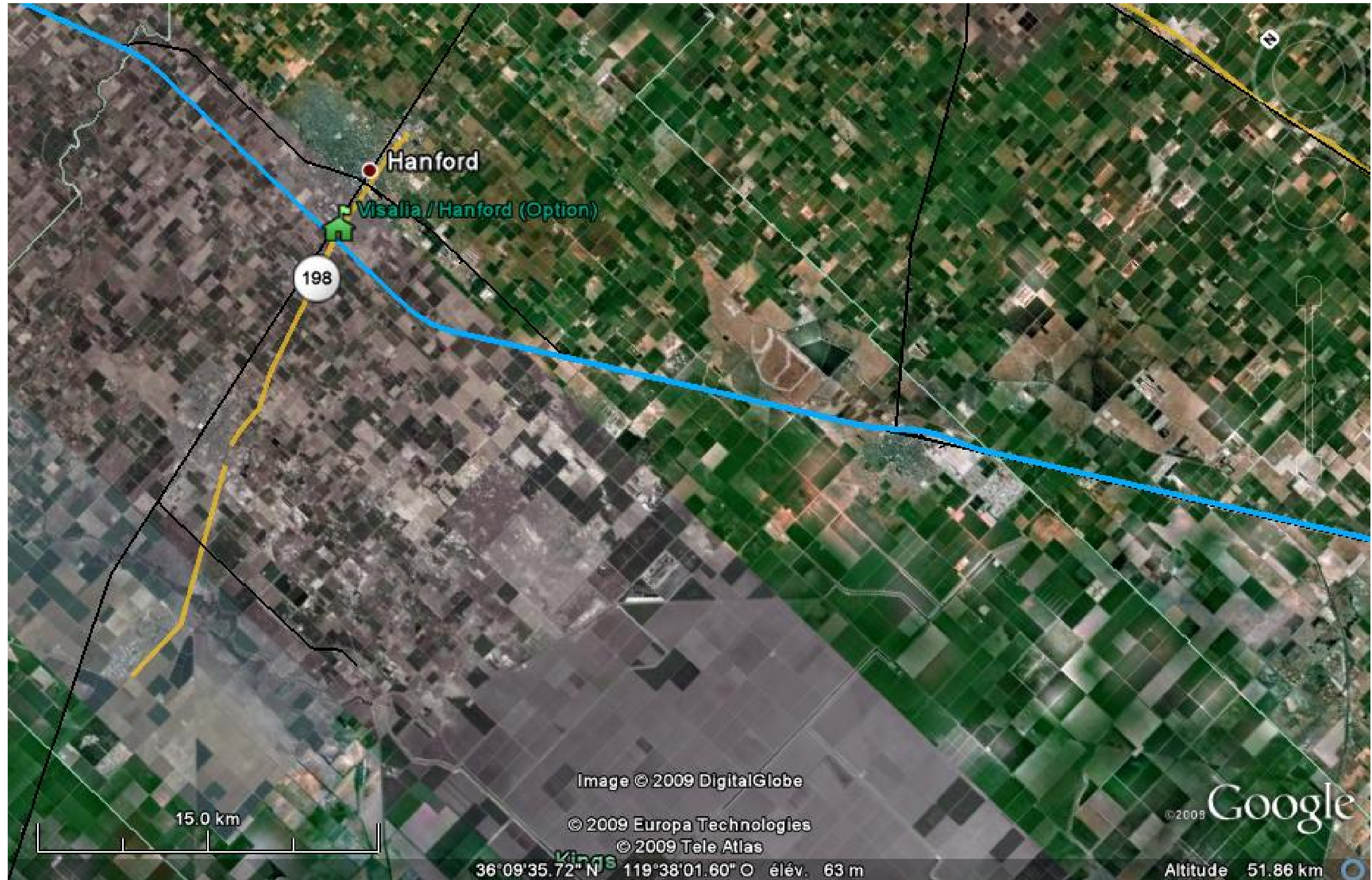




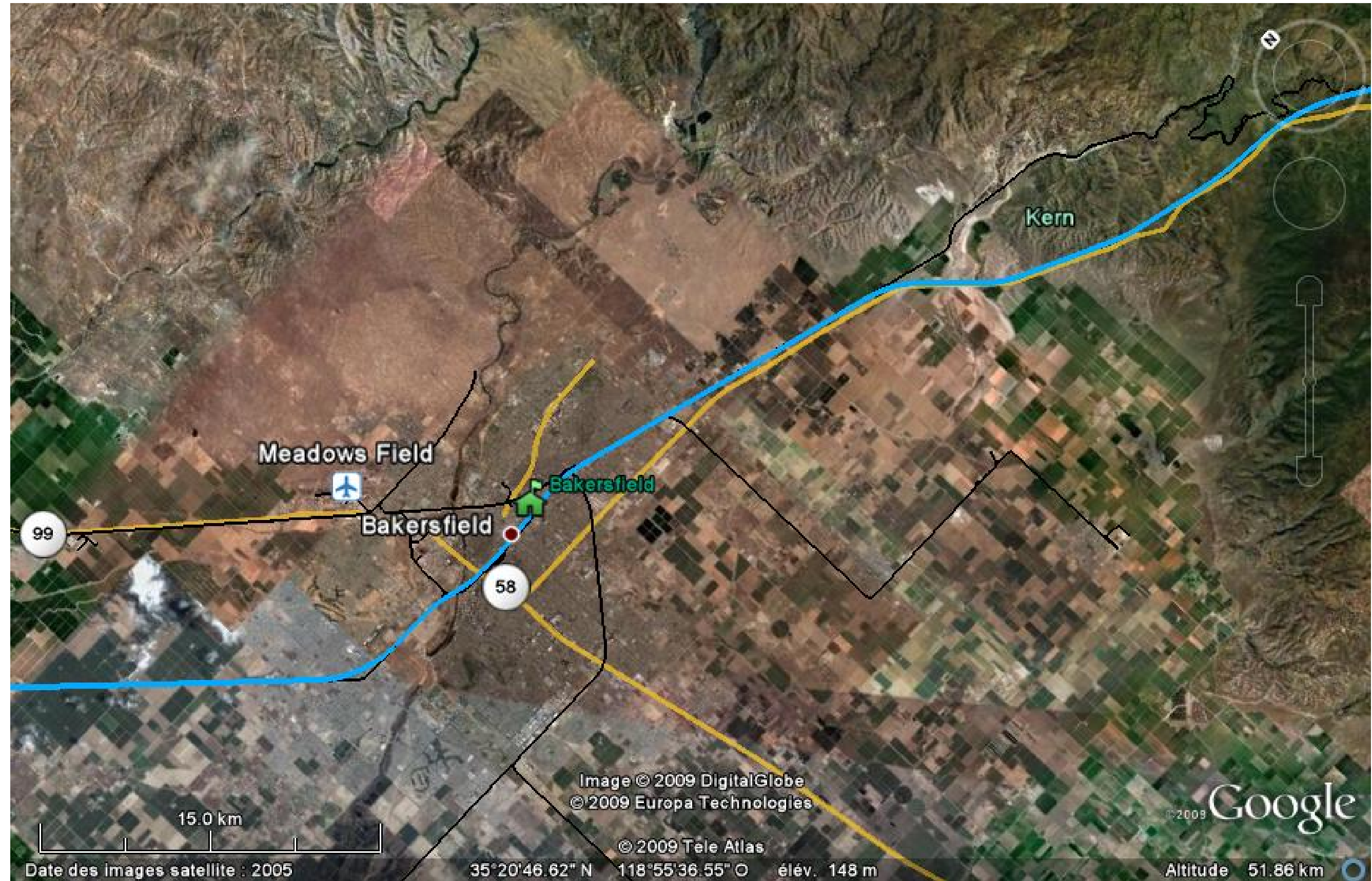


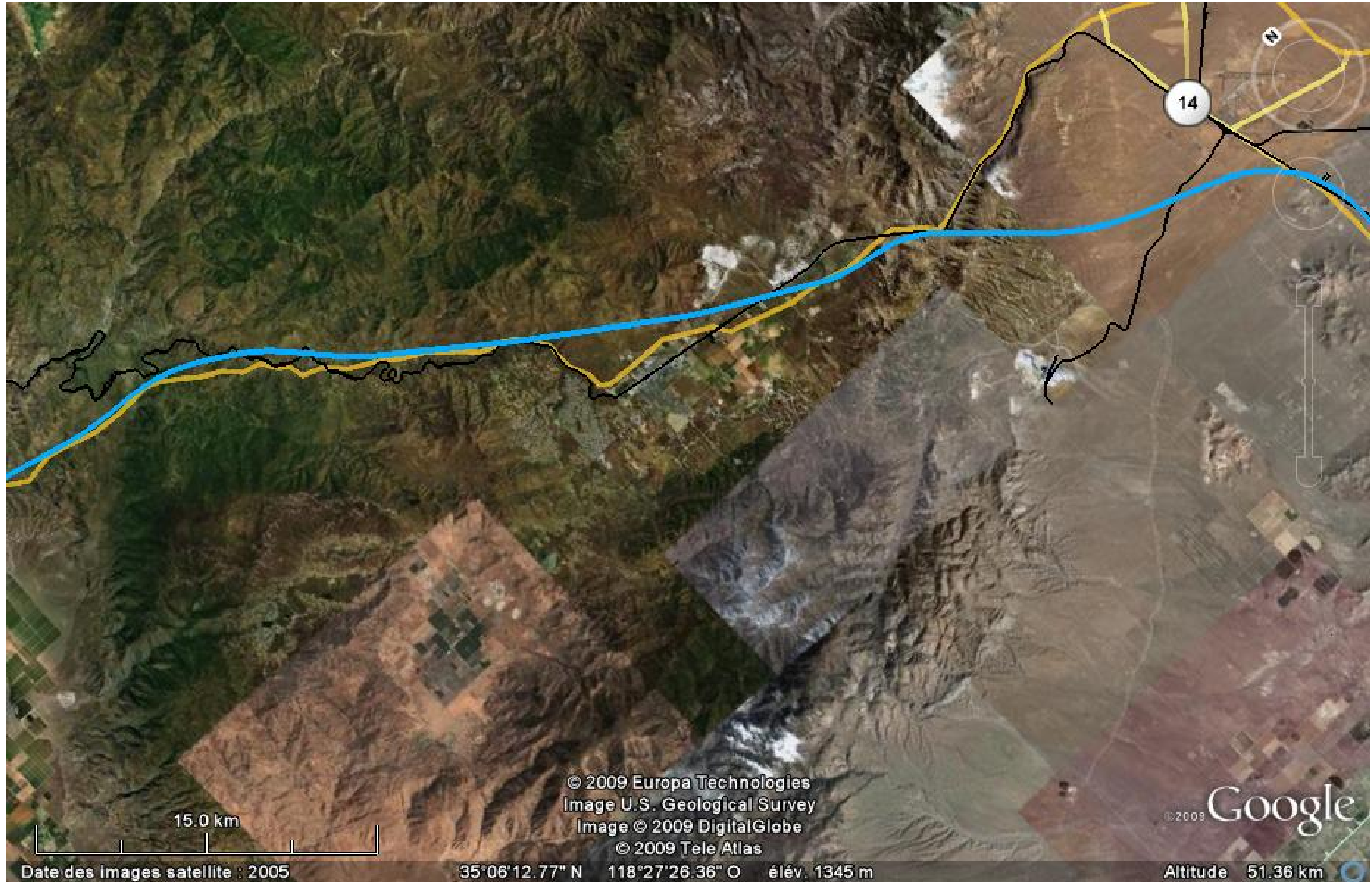


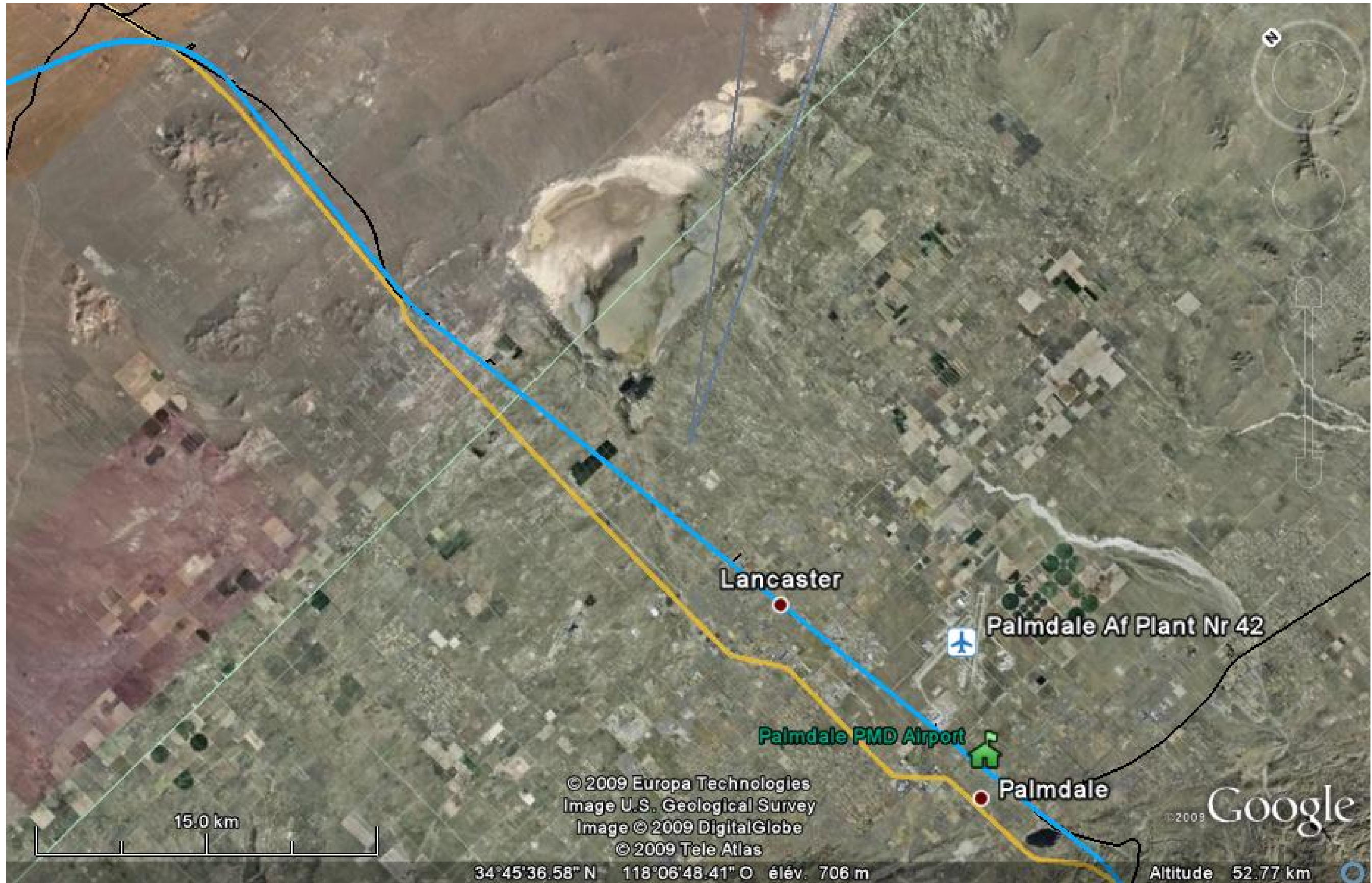


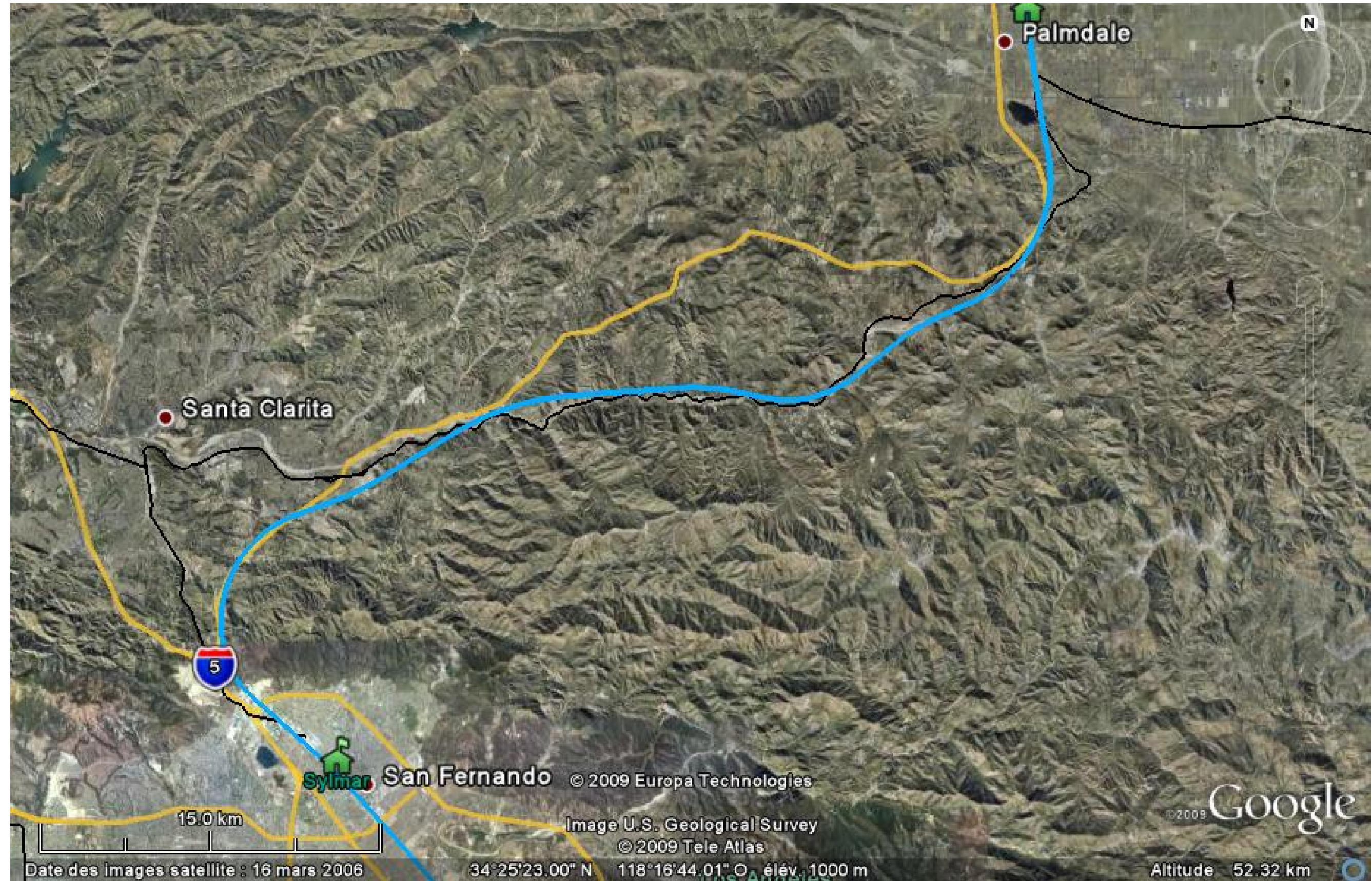


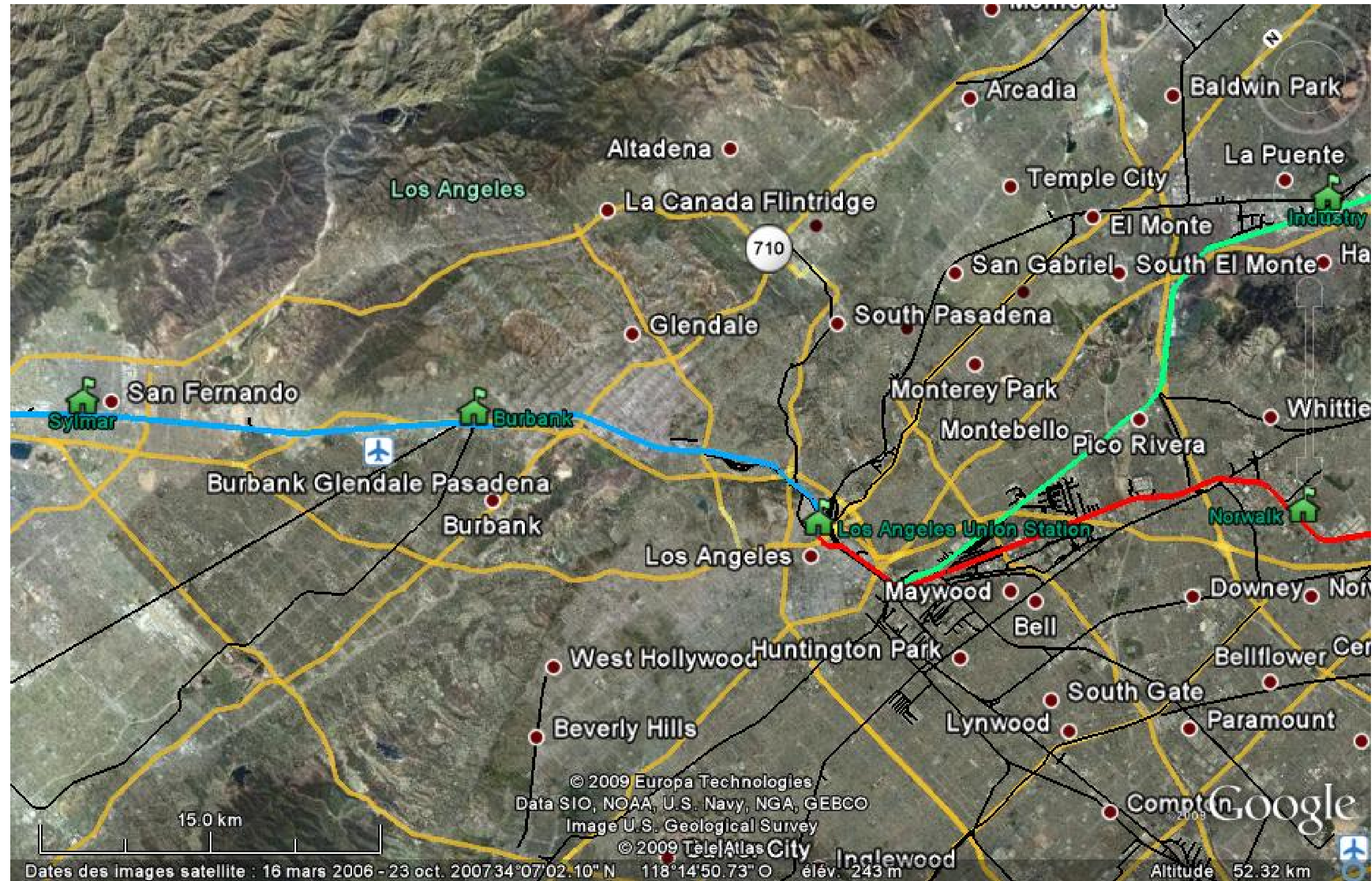


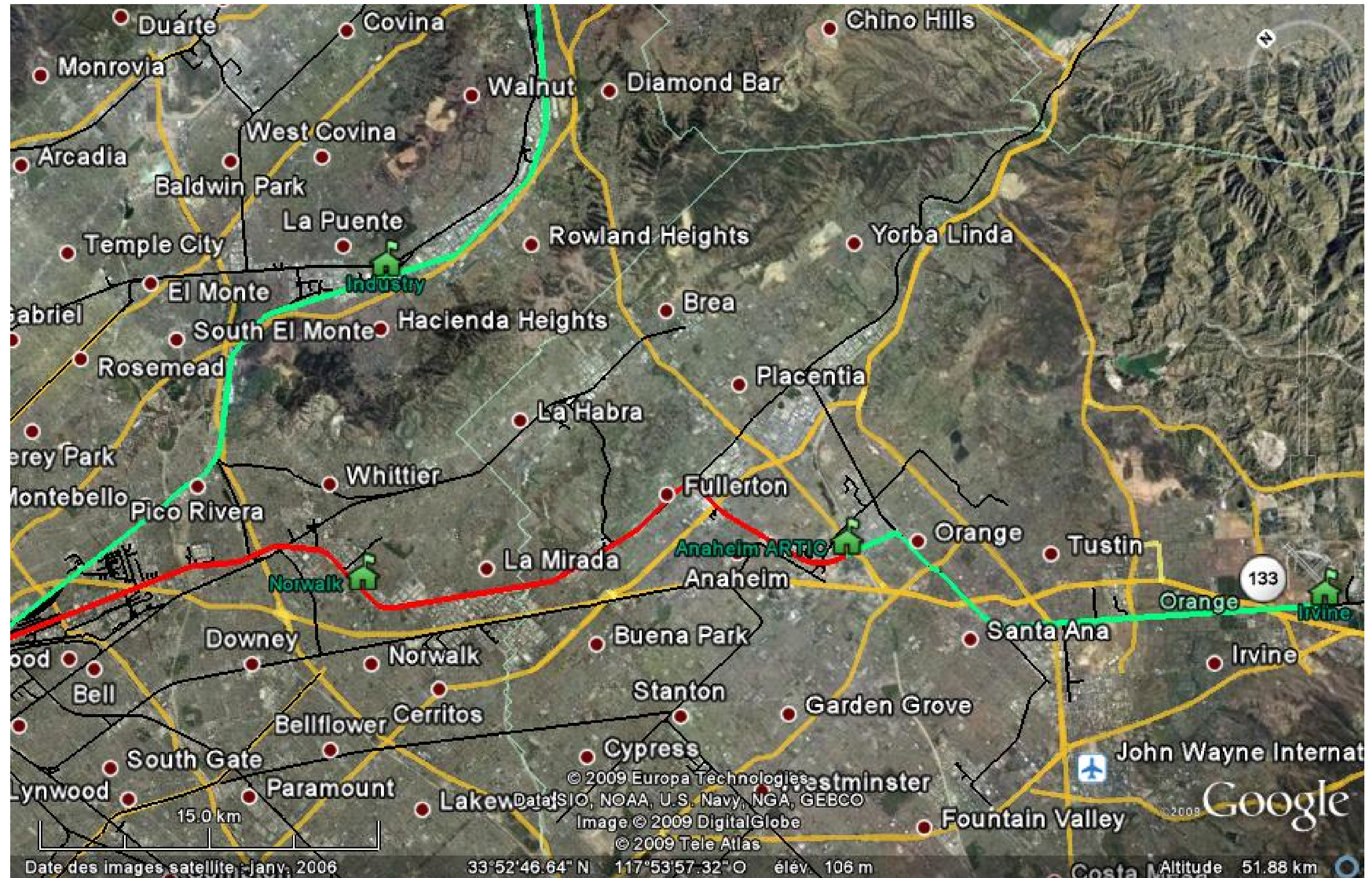












APPENDIX 9. Alignment description

SNCF proposes to construct, operate and maintain an electric-powered steel-wheel-on-steel rail HST system, about 800 miles long, capable of operating speeds of 220 miles per hour (mph) on mostly dedicated, fully graded-separated tracks, with state-of-the-art safety, signaling and automated train control systems.

Scoping been well engaged in California, through the EIR/EIS process, SNCF chose to endorse the route proposed by the CHSR.

California Corridor – route – detailed description:

The route will provide service to most Californians. It follows from:

San Francisco to San Jose: the Caltrain right-of-way along the San Francisco Peninsula. Intermediate potential stations will be located in Redwood City or Palo Alto and in Millbrae serving San Francisco International Airport.

San Jose to Merced: the Caltrain/Union Pacific Railroad from San Jose to Gilroy. The alignment extends then east through the mountainous Pacheco Pass, generally following State route 152, and then along Henry Miller Road to Chowchilla to connect with the Merced to Bakersfield section. The intermediate station in Gilroy will serve the Monterey Bay area.

Merced to Sacramento: one of the two existing freight rail corridors. Intermediate downtown multi-modal stations are located throughout the Central Valley at Stockton and Merced.

Merced to Bakersfield: the Union Pacific Railroad (UPRR) through the Central Valley from Merced to Madera and, the Burlington Northern Santa Fe (BNSF) railroad from Madera to Bakersfield through Fresno and Hanford. Intermediate downtown multi-modal stations are located throughout the Central Valley at Fresno and Visalia/Tulare/Hanford. The alignment uses therefore the UPRR corridor through the urban area of Fresno and requires a new high speed alignment near the city of Hanford.

Bakersfield to Palmdale: the Tehachapi Range through the Mojave Pass (SR 58 corridor) and the Antelope Valley (which will minimize tunneling, seismic constraints, risks and environmental impacts).

Palmdale to Los Angeles: both SR-14 and SCRRA/Metrolink Railroad between the Antelope Valley & Santa Clarita and, the MTA/Metrolink train tracks from Sylmar to Los Angeles through Burbank. In addition to the Palmdale Airport/Transportation Center, intermediate stations are located at Sylmar to serve the San Fernando Valley, Simi Valley and Newhall/Santa Clarita areas, and downtown Burbank (Metrolink) to serve the Burbank/Glendale area.

Los Angeles to Anaheim: the existing passenger and freight rail corridor through Norwalk.



Los Angeles to San Diego: the Inland Empire (Riverside and San Bernardino counties) using existing transportation corridors, and then continue south from Riverside using the Interstate 215/Interstate 15 highway corridor through Escondido. Intermediate stations will be built to serve East San Gabriel Valley, Ontario Airport, Riverside, Temecula Valley, Escondido and University City (San Diego). The southern terminus of the system will be Santa Fe Depot in downtown San Diego.

Altamont Pass Corridor – future development: In partnership with local and regional agencies and transit providers, a joint-use (regional rail and high-speed train) infrastructure project in the Altamont Pass corridor could be envisaged for the San Francisco Bay area providing connectivity and accessibility to Oakland and Oakland International Airport via this route.

APPENDIX 10. Suggestions for the design and inside fittings of hs trains

Principles

It is proposed that trainset design be based on the Technical Specifications for Interoperability (TSI) for High-Speed Rolling Stock, which set out:
the essential requirements in relation to safety, reliability, health and environmental protection.

the rolling stock functional specifications, for example mechanical characteristics, vehicle gauge, dynamic behavior, traction and braking performance, safety and detection systems, passenger information and comfort, man-machine interfaces.

the methods for assessing vehicle compliance.

The following link is to the UK Ministry of Transport website and provides fuller details about the TSI:

<http://www.dft.gov.uk/pgr/rail/interoperabilityandstandards/>

SNCF recommendation

From experience, SNCF is able to make the following recommendations:

articulated trainsets with trucks positioned between the cars. With their long 9.84 foot wheelbase and their 17 metric ton axle loads, the dynamics of these trucks are excellent, an assertion borne out by the world record of 357 mph. By positioning the trucks between the cars, the center of gravity of the train is lower but, more important, the train can form an articulated unit remarkable for its dynamic behavior and stability, including in the unlikely event of a derailment. The design of the system guarantees a high degree of safety.



(left) The train that broke the world speed record on 3 April 2007 and (below) one of its 9.84 foot wheelbase trucks.



•

- Electronic and electrical equipment directly taken from that used on the most recent TGC high-speed trainsets placed in service by SNCF to ensure high standards of availability and contain maintenance costs right from the start.
In addition, the electrics proposed for the train allow for the possibility of regenerative braking, which will further drive down energy consumption.
- The train design suggested is basically modular in design, with each vehicle consisting of a number of different modules. The concept facilitates maintenance and enables standard maintenance techniques to be used for each module, for greater reliability and more affordable maintenance costs.



Over 30 years of operation, passenger requirements are bound to change. The mechanical structures of the cars will therefore be designed to allow for adaptations to the inside fittings, for example, new seat layout patterns.

Every year, SNCF completely refurbishes over a dozen trains in its workshops.

Inside fittings and amenities on board

The inside fittings of the train will depend on the findings of market research. Different areas with different standards of comfort, each offering services tailored to different categories of passenger may be provided.

SNCF has built up substantial experience in both new vehicle design and vehicle refurbishment.

The following illustrations give some idea of potential HST inside arrangements:

"Leisure" cars

These cars are designed for price-conscious passengers traveling for private or leisure purposes. They offer Wifi access facilities or electric plugs.



The seating arrangements include blocks of seats for couples, groups, etc.

"Comfort" cars

These cars are designed for passengers traveling for private or leisure purposes but who appreciate value for money. The seat layout offers more space than in the "leisure" cars.



"Business" cars

These cars are designed for passengers traveling on business, who are looking for a quality service. The focus is on creating a working environment, not only via surfaces for their portable PC, USB sockets and WiFi coverage but via special meeting compartments.



Buffet car

Trains may include a bar car selling refreshments for on the spot or at-seat consumption.



HST performance on SNCF – some figures

Fleet of TGV high-speed trains in operation

SNCF has 462 high-speed TGV trainsets in operation

415 on domestic routes over the five French HS lines

44 on European routes with 6 other countries (UK, Netherlands, Belgium, Germany, Switzerland, Italy)

Distances covered

Since the opening of the first high-speed line between Paris and Lyons in 1981, the 415 TGV on French domestic routes have clocked up a total of 1.6 billion miles, which is an annual average of 250,000 miles per trainset.

The most recent models cover more than 305,000 miles per year

Some TGV high-speed trains can travel up to nearly 2,000 miles per day.



Fleet availability

To cater to weekend traffic peaks, train maintenance operations are scheduled to take place between midday on Mondays and Thursday evening and at night.

By timing maintenance in this way, approximately 80% of the fleet can be available in the week (between Monday noon and Friday noon) and as much as 98% at weekends.



TGV maintenance centers are designed to keep the time spent by the trains in the sheds to a minimum.

APPENDIX 11. Ridership and Farebox revenues forecasts

Ridership: in million of trips, both directions
Farebox: Millions of USD, 2008\$, taxes included

Years	Ridership	Farebox revenue
2018	3,009	\$88.4
2019	6,682	\$196
2020	8,463	\$249
2021	22,323	\$883
2022	38,749	\$1,643
2023	46,798	\$2,013
2024	49,313	\$2,127
2025	50,157	\$2,163
2026	51,016	\$2,200
2027	51,889	\$2,238
2028	52,777	\$2,276
2029	53,681	\$2,315
2030	54,600	\$2,355
2031	55,519	\$2,397
2032	56,454	\$2,435
2033	57,404	\$2,476
2034	58,370	\$2,518
2035	59,353	\$2,560
2036	60,352	\$2,603
2037	61,368	\$2,647
2038	62,401	\$2,691
2039	63,451	\$2,737
2040	64,519	\$2,783
2041	64,519	\$2,783
2042	64,519	\$2,783
2043	64,519	\$2,783
2044	64,519	\$2,783
2045	64,519	\$2,783
2046	64,519	\$2,783
2047	64,519	\$2,783
2048	64,519	\$2,783
2049	64,519	\$2,783

APPENDIX 12. Overall financials

Global Financial Approach

Year (e-o-p)			31/12/10	31/12/11	31/12/12	31/12/13	31/12/14	31/12/15	31/12/16	31/12/17	31/12/18	31/12/19	31/12/20
Passenger Revenues	138 207	MUSD	0	0	0	0	0	0	0	0	102	231	300
Operating Costs	32 330	MUSD	0	0	0	0	0	0	0	0	78	77	76
Maintenance Costs	25 404	MUSD	0	0	0	0	0	0	0	0	89	87	86
EBITDA	80 472	MUSD	0	0	0	0	0	0	0	0	-65	67	138
Infrastructure depreciation	15 105	MUSD	0	0	0	0	0	0	0	0	242	242	242
Rolling Stock depreciation	12 143	MUSD	0	0	0	0	0	0	0	0	40	40	40
EBIT	53 224	MUSD	0	0	0	0	0	0	0	0	-348	-215	-144
Capital costs for Infrastructures	33 419	MUSD	78	613	3 764	5 880	4 828	1 078	488	4 293	6 421	5 175	802
Capital costs Rolling Stock	12 932	MUSD	0	0	0	0	0	0	0	566	629	0	0

Global Financial Approach

Year (e-o-p)			31/12/21	31/12/22	31/12/23	31/12/24	31/12/25	31/12/26	31/12/27	31/12/28	31/12/29	31/12/30
Passenger Revenues	138 207	MUSD	1 092	2 083	2 617	2 834	2 955	3 080	3 211	3 348	3 490	3 639
Operating Costs	32 330	MUSD	313	548	668	711	942	967	993	1 020	1 047	1 075
Maintenance Costs	25 404	MUSD	255	435	528	561	738	757	778	798	819	841
EBITDA	80 472	MUSD	525	1 099	1 421	1 562	1 275	1 356	1 441	1 530	1 624	1 723
Infrastructure depreciation	15 105	MUSD	479	479	479	479	479	479	479	479	479	479
Rolling Stock depreciation	12 143	MUSD	132	232	281	298	390	398	406	414	422	431
EBIT	53 224	MUSD	-87	388	660	785	406	479	556	637	722	812
Capital costs for Infrastructures	33 419	MUSD	0	0	0	0	0	0	0	0	0	0
Capital costs Rolling Stock	12 932	MUSD	2 762	2 991	1 478	505	2 761	236	242	248	254	260

Global Financial Approach

Year (e-o-p)			31/12/31	31/12/32	31/12/33	31/12/34	31/12/35	31/12/36	31/12/37	31/12/38	31/12/39	31/12/40
Passenger Revenues	138 207	MUSD	3 793	3 953	4 120	4 294	4 476	4 665	4 862	5 067	5 281	5 504
Operating Costs	32 330	MUSD	1 086	1 096	1 107	1 117	1 128	1 139	1 150	1 161	1 172	1 183
Maintenance Costs	25 404	MUSD	849	857	866	874	882	891	899	908	917	926
EBITDA	80 472	MUSD	1 858	2 000	2 148	2 303	2 465	2 635	2 812	2 998	3 192	3 395
Infrastructure depreciation	15 105	MUSD	479	479	479	479	479	479	479	479	479	479
Rolling Stock depreciation	12 143	MUSD	431	431	431	431	431	431	431	431	431	431
EBIT	53 224	MUSD	948	1 089	1 237	1 393	1 555	1 725	1 902	2 088	2 282	2 485
Capital costs for Infrastructures	33 419	MUSD	0	0	0	0	0	0	0	0	0	0
Capital costs Rolling Stock	12 932	MUSD	0	0	0	0	0	0	0	0	0	0

Global Financial Approach

Year (e-o-p)			31/12/41	31/12/42	31/12/43	31/12/44	31/12/45	31/12/46	31/12/47	31/12/48	31/12/49	31/12/50
Passenger Revenues	138 207	MUSD	5 642	5 783	5 928	6 076	6 228	6 383	6 543	6 707	6 874	7 046
Operating Costs	32 330	MUSD	1 195	1 206	1 218	1 230	1 241	1 253	1 265	1 278	1 290	1 302
Maintenance Costs	25 404	MUSD	935	944	953	962	971	980	990	999	1 009	1 019
EBITDA	80 472	MUSD	3 513	3 633	3 757	3 884	4 015	4 150	4 288	4 430	4 575	4 725
Infrastructure depreciation	15 105	MUSD	479	479	479	479	479	479	479	479	479	479
Rolling Stock depreciation	12 143	MUSD	431	431	431	431	431	431	431	431	431	431
EBIT	53 224	MUSD	2 602	2 723	2 847	2 974	3 105	3 239	3 377	3 519	3 665	3 815
Capital costs for Infrastructures	33 419	MUSD	0	0	0	0	0	0	0	0	0	0
Capital costs Rolling Stock	12 932	MUSD	0	0	0	0	0	0	0	0	0	0

APPENDIX 13. SPC P&L Cash flow statement

SPC P&L statement

SPC P&L Statement

Year (e-o-p)			31/12/17	31/12/18	31/12/19	31/12/20	31/12/21	31/12/22	31/12/23	31/12/24	31/12/25	31/12/26	31/12/27	31/12/28	31/12/29	31/12/30
+ Operating revenues	138 207	MUSD	0	102	231	300	1 092	2 083	2 617	2 834	2 955	3 080	3 211	3 348	3 490	3 639
- Opex	57 735	MUSD	0	167	164	162	567	984	1 196	1 272	1 679	1 724	1 770	1 818	1 866	1 916
- Contributory Capacity	40 648	MUSD	0	0	15	30	115	242	313	344	242	258	274	291	309	327
= EBITDA	39 824	MUSD	0	-65	52	108	409	857	1 108	1 219	1 033	1 098	1 167	1 239	1 315	1 395
- Economic depreciation	12 143	MUSD	0	40	40	40	132	232	281	298	390	398	406	414	422	431
= EBIT	27 681	MUSD	0	-105	12	68	277	626	827	921	643	701	762	826	893	964
- Interests & Fees	5 981	MUSD	14	42	57	57	124	258	361	396	452	497	480	455	428	402
= Net Profit before Tax	21 699	MUSD	-14	-148	-45	11	154	368	466	525	191	203	281	371	465	562
- Corporate Tax	6 522	MUSD	0	0	0	0	0	110	140	157	57	61	84	111	139	169
= Net Profit	15 177	MUSD	-14	-148	-45	11	154	257	326	367	134	142	197	260	325	394

SPC P&L Statement

Year (e-o-p)			31/12/31	31/12/32	31/12/33	31/12/34	31/12/35	31/12/36	31/12/37	31/12/38	31/12/39	31/12/40	31/12/41	31/12/42	31/12/43	31/12/44
+ Operating revenues	138 207	MUSD	3 793	3 953	4 120	4 294	4 476	4 665	4 862	5 067	5 281	5 504	5 642	5 783	5 928	6 076
- Opex	57 735	MUSD	1 935	1 953	1 972	1 991	2 010	2 030	2 049	2 069	2 089	2 109	2 129	2 150	2 171	2 191
- Contributory Capacity	40 648	MUSD	353	380	408	438	468	1 686	1 800	1 919	2 043	2 173	2 248	2 325	2 405	2 486
= EBITDA	39 824	MUSD	1 505	1 620	1 740	1 865	1 997	949	1 012	1 079	1 149	1 222	1 265	1 308	1 353	1 398
- Economic depreciation	12 143	MUSD	431	431	431	431	431	431	431	431	431	431	431	431	431	431
= EBIT	27 681	MUSD	1 074	1 189	1 309	1 434	1 566	518	581	648	718	791	834	877	922	967
- Interests & Fees	5 981	MUSD	368	328	286	245	204	162	125	87	58	39	25	12	8	5
= Net Profit before Tax	21 699	MUSD	705	861	1 022	1 189	1 362	355	457	561	660	752	809	865	913	962
- Corporate Tax	6 522	MUSD	212	258	307	357	409	107	137	168	198	226	243	259	274	289
= Net Profit	15 177	MUSD	494	603	716	832	953	249	320	393	462	526	566	605	639	674

SPC P&L Statement

Year (e-o-p)			31/12/45	31/12/46	31/12/47	31/12/48	31/12/49	31/12/50
+ Operating revenues	138 207	MUSD	6 228	6 383	6 543	6 707	6 874	7 046
- Opex	57 735	MUSD	2 213	2 234	2 255	2 277	2 299	2 321
- Contributory Capacity	40 648	MUSD	2 570	2 656	2 744	2 835	2 928	3 024
= EBITDA	39 824	MUSD	1 445	1 494	1 544	1 595	1 647	1 701
- Economic depreciation	12 143	MUSD	431	431	431	431	431	431
= EBIT	27 681	MUSD	1 014	1 063	1 113	1 164	1 216	1 270
- Interests & Fees	5 981	MUSD	2	1	0	0	0	0
= Net Profit before Tax	21 699	MUSD	1 012	1 062	1 113	1 164	1 216	1 270
- Corporate Tax	6 522	MUSD	304	319	334	349	365	381
= Net Profit	15 177	MUSD	708	743	779	815	851	889



SPC Cash flow statement

SPC Cash-Flow Statement

Year (e-o-p)		31/12/17	31/12/18	31/12/19	31/12/20	31/12/21	31/12/22	31/12/23	31/12/24	31/12/25	31/12/26	31/12/27	31/12/28	31/12/29	31/12/30
Cash Flow - Start of Period	MUSD	0	16	9	33	84	306	516	585	513	453	374	156	0	0
- Capital Expenditures (Initial Costs & Renewals)	MUSD	566	629	0	0	2 762	2 991	1 478	505	2 761	236	242	248	254	260
+ EBITDA	MUSD	0	-65	52	108	409	857	1 108	1 219	1 033	1 098	1 167	1 239	1 315	1 395
-Variation in Working Capital Need	MUSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Corporate Tax	MUSD	0	0	0	0	0	110	140	157	57	61	84	111	139	169
Sub total	MUSD	-566	-695	52	108	-2 353	-2 244	-510	556	-1 785	802	841	880	922	966
Cash Flow available before Funding	MUSD	-566	-678	61	141	-2 269	-1 938	6	1 142	-1 273	1 254	1 215	1 037	922	966
+ Equity Injection	MUSD	143	226	30	0	552	598	296	101	552	47	48	50	51	52
+ Inv. Public Subsidies	MUSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+ Drawings	MUSD	453	503	0	0	2 209	2 393	1 183	404	2 209	189	193	198	203	208
Sub total	MUSD	596	729	30	0	2 762	2 991	1 478	505	2 761	236	242	248	254	260
Cash Flow available before Debt Service	MUSD	30	51	91	141	493	1 053	1 484	1 647	1 488	1 490	1 457	1 284	1 176	1 227
- Loan Interests & Fees	5 981 MUSD	14	42	57	57	124	258	361	396	452	497	480	455	428	402
- Debt Repayment	10345 MUSD	0	0	0	0	64	64	211	371	449	476	624	636	649	662
Sub Total Debt Service	MUSD	14	42	57	57	187	322	572	767	902	974	1 104	1 091	1 078	1 064
Cash flow available before Dividends	MUSD	16	9	33	84	306	731	911	880	586	516	353	194	99	162
- Dividends	15 177 MUSD	0	0	0	0	0	215	326	367	134	142	197	194	99	162
Cash Flow - End of Period	MUSD	16	9	33	84	306	516	585	513	453	374	156	0	0	0

SPC Cash-Flow Statement

Year (e-o-p)		31/12/31	31/12/32	31/12/33	31/12/34	31/12/35	31/12/36	31/12/37	31/12/38	31/12/39	31/12/40	31/12/41	31/12/42	31/12/43	31/12/44
Cash Flow - Start of Period	MUSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Capital Expenditures (Initial Costs & Renewals)	MUSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+ EBITDA	MUSD	1 505	1 620	1 740	1 865	1 997	949	1 012	1 079	1 149	1 222	1 265	1 308	1 353	1 398
-Variation in Working Capital Need	MUSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Corporate Tax	MUSD	212	258	307	357	409	107	137	168	198	226	243	259	274	289
Sub total	MUSD	1 293	1 361	1 433	1 509	1 588	842	875	911	951	997	1 022	1 049	1 079	1 110
Cash Flow available before Funding	MUSD	1 293	1 361	1 433	1 509	1 588	842	875	911	951	997	1 022	1 049	1 079	1 110
+ Equity Injection	MUSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+ Inv. Public Subsidies	MUSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+ Drawings	MUSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub total	MUSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash Flow available before Debt Service	MUSD	1 293	1 361	1 433	1 509	1 588	842	875	911	951	997	1 022	1 049	1 079	1 110
- Loan Interests & Fees	5 981 MUSD	368	328	286	245	204	162	125	87	58	39	25	12	8	5
- Debt Repayment	10345 MUSD	676	690	690	690	690	626	626	479	319	240	213	66	54	41
Sub Total Debt Service	MUSD	1 044	1 018	976	935	893	788	751	566	378	280	238	78	62	46
Cash flow available before Dividends	MUSD	249	344	457	574	695	54	125	345	574	717	784	970	1 017	1 064
- Dividends	15 177 MUSD	249	344	457	574	695	54	125	345	574	717	784	970	1 017	1 064
Cash Flow - End of Period	MUSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SPC Cash-Flow Statement

Year (e-o-p)		31/12/45	31/12/46	31/12/47	31/12/48	31/12/49	31/12/50
Cash Flow - Start of Period	MUSD	0	0	234	665	1 096	1 527
- Capital Expenditures (Initial Costs & Renewals)	MUSD	0	0	0	0	0	0
+ EBITDA	MUSD	1 445	1 494	1 544	1 595	1 647	1 701
-Variation in Working Capital Need	MUSD	0	0	0	0	0	0
- Corporate Tax	MUSD	304	319	334	349	365	381
Sub total	MUSD	1 142	1 175	1 210	1 246	1 282	1 320
Cash Flow available before Funding	MUSD	1 142	1 175	1 443	1 910	2 378	2 847
+ Equity Injection	MUSD	0	0	0	0	0	0
+ Inv. Public Subsidies	MUSD	0	0	0	0	0	0
+ Drawings	MUSD	0	0	0	0	0	0
Sub total	MUSD	0	0	0	0	0	0
Cash Flow available before Debt Service	MUSD	1 142	1 175	1 443	1 910	2 378	2 847
- Loan Interests & Fees	5 981 MUSD	2	1	0	0	0	0
- Debt Repayment	10345 MUSD	27	14	0	0	0	0
Sub Total Debt Service	MUSD	30	15	0	0	0	0
Cash flow available before Dividends	MUSD	1 112	1 161	1 443	1 910	2 378	2 847
- Dividends	15 177 MUSD	1 112	927	779	815	851	889
Cash Flow - End of Period	MUSD	0	234	665	1 096	1 527	1 958

Appendix 14 - RFEI 2009 - Reference List

Date	Topic	Author	Title
Dec-08	General Information	For Amtrak by Cambridge Systematics and SYSTRA Consulting	High-Speed Rail: A National Perspective - High-Speed Rail Experience in the United States
Jan-09	General Information	111th Congress of the United States	American Recovery and Reinvestment Act (ARRA)
Mar-09	General Information	U.S. Government Accountability Office	High-Speed Passenger Rail: Future Development will Depend on Addressing Financial and Other Challenges and Establishing a Clear Federal Role
Mar-09	General Information	Amtrak	Northeast Corridor State of Good Repair Spend Plan
Jan-09	General Information	110th Congress of the United States	Passenger Rail Investment and Improvement Act (PRIIA)
Apr-09	General Information	SYSTRA Consulting	U.S. High-Speed Rail Briefing
Apr-09	Corridor-California	California High-Speed Rail Authority	California High-Speed Train Program Update
Dec-08	Corridor-California	For Amtrak by Cambridge Systematics and SYSTRA Consulting	California High-Speed Rail Corridor Fact Sheet (Taken from High-Speed Rail: A National Perspective - High-Speed Rail Experience in the United States)
Feb-09	Corridor-California	SYSTRA Consulting	CA HSR: A Case Study
Feb-08 to Mar-09	Corridor-California	California High-Speed Rail Authority	CAHSRA Board Meeting Minutes
-	Corridor-California	Cambridge Systematics	Benefit-Cost Analysis
2008	Corridor-California	Cambridge Systematics	Technical Documentation of Benefit-Cost Analysis for the 2008 Business Plan
2008	San Francisco and Merced to Anaheim	California High-Speed Rail Authority	Business Plan 2008 — Engineering Elements, System Description, Project Delivery, and Capital and O&M Costs
Oct-08	San Francisco to Anaheim	Infrastructure Management Group	Financial Plan
-	Corridor-California	California High-Speed Rail Authority	High Speed Train Systems

Appendix 14 - RFEI 2009 - Reference List

Date	Topic	Author	Title
-	Corridor-California	PB, Cambridge Systematics and SYSTRA	Ridership and Revenue Forecasts
-	Corridor-California	California High-Speed Rail Authority (CAHSRA)	Route Selection Criteria
-	Corridor-California	CAHSRA	Total Transportation Approach
Nov-08	Corridor-California	CAHSRA	Business Plan
-	Corridor-California	CAHSRA	Environmental Protection Summary
-	Corridor-California	CAHSRA	Financing California's High Speed Train System
-	Corridor-California	CAHSRA	Construction and Permanent Jobs Summary
-	Corridor-California	CAHSRA	Route Maps
-	Corridor-California	Various	News Articles
Jan-04	Corridor-California	CAHSRA	Capital, Operations, and Maintenance Costs
Jul-08	Corridor-California	Center for Global Metropolitan Studies	Transit Oriented Development
May-08	Bay Area to Central Valley	CAHSRA	Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) Volume 1
May-08	Bay Area to Central Valley	CAHSRA	Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) Volume 2
May-08	Bay Area to Central Valley	CAHSRA	Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) Volume 3
Jun-08	Bay Area to Central Valley	CAHSRA	Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) Staff Report
Feb-09	Corridor-California	CAHSRA	Project -Level Environmental Analysis Methodologies
Sep-08	Corridor-California	Navigant Consulting	The Use Of Renewable Energy Sources To Provide Power to California's High Speed Rail
May-05	Corridor-California	Cambridge Systematics, SYSTRA	Ridership and Revenue Forecasting Study

Appendix 14 - RFEI 2009 - Reference List

Date	Topic	Author	Title
May-08	Corridor-California	FlyCalifornia	Station Development Policies
Dec-05	Corridor-California	Cambridge Systematics	HSR Survey Documentation
Jun-00	Corridor-Florida	STV for Florida Department of Transportation (FDOT)	Cross-State Rail Feasibility Study Executive Summary
Dec-09	Corridor-Florida	Florida Department of Transportation (FDOT)	District One Rail Traffic Evaluation Study Workshop
Jan-09	Corridor-Florida	Florida High-Speed Rail Authority (FHSRA)	FHSRA Annual Report
Feb-09	Corridor-Florida	Florida High-Speed Rail Authority (FHSRA)	FHSRA Board Meeting at Greater Orlando Aviation Authority- Agenda
Feb-09	Corridor-Florida	SYSTRA Consulting	FHSRA Board Meeting at Greater Orlando Aviation Authority- Meeting Notes
Dec-09	Corridor-Florida	For Amtrak by Cambridge Systematics and SYSTRA Consulting	Florida High-Speed Rail Corridor Fact Sheet (Taken from High-Speed Rail: A National Perspective - High-Speed Rail Experience in the United States)
-	Corridor-Florida		History of High-Speed Rail in Florida - Chronology of Events
Feb-09	Corridor-Florida	Florida High-Speed Rail Authority (FHSRA)	Governor support for the Florida High-Speed Rail Authority
May-09	Corridor-Florida	FRA, USDOT, FHSRA	FEIS - Tampa to Orlando
Jan-09	Corridor-Florida	Center For Urban Transportation Research	Report from Peer Panel to the Florida High Speed Rail Authority - Orlando to Tampa Travel Demand Forecasts
Jan-09	Corridor-Florida	Florida High-Speed Rail Authority (FHSRA)	2006 Report to the Governor and the Legislature
Jan-09	Corridor-Florida	unknown	Florida Rail Network Map
Apr-09	Corridor-Florida	unknown	Florida High Speed Rail Authority Workshop
Apr-09	Corridor-Florida	Florida High-Speed Rail Authority (FHSRA)	Florida High-Speed Rail Authority (FHSRA) Meeting Minutes

Appendix 14 - RFEI 2009 - Reference List

Date	Topic	Author	Title
-	Corridor-Florida	Seaboard System Railroad (predecessor to CSX)	Track Charts - Seaboard System Railroad
Aug-03	Corridor-Florida	Fluor-Bombardier	Fluor Bombardier Letter
Dec-08	Corridor-South Central	For Amtrak by Cambridge Systematics and SYSTRA Consulting	South Central High-Speed Rail Corridor Fact Sheet (Taken from High-Speed Rail: A National Perspective - High-Speed Rail Experience in the United States)
-	Corridor-South Central	Union Pacific	Track Charts - Union Pacific Railroad
1998	Corridor-South Central	BNSF Railway	Track Charts -BNSF Railway Fort Worth Subdivision
1992-1993	Corridor-South Central	Nick Brand	Texas TGV System Description
2008	Corridor-South Central	Texas High Speed Rail and Transportation Corporation	Texas T-Bone High Speed Rail Corridor Map
Jun-04	Corridor-Chicago Hub	Transportation Economics & Management Systems, Inc and HNTB	Midwest Regional Rail Initiative Project Notebook
Jun-04	Corridor-Chicago Hub	Transportation Economics & Management Systems, Inc and HNTB	Midwest Regional Rail Initiative Project Appendices
-	Corridor-Chicago Hub	Midwest High-Speed Rail Association, Illinois AFL & CIO, Environmental Law and Policy Center	Five-Year Passenger Train Development Plan for Illinois- Supplemental Information and Budgeted Projects
Nov-06	Corridor-Chicago Hub	Transportation Economics & Management Systems, Inc and HNTB	Midwest Regional Rail Initiative Benefit Cost & Economic Analysis
Dec-08	Corridor-Chicago Hub	Amtrak by Cambridge Systematics and SYSTRA Consulting	Chicago Hub High-Speed Rail Corridor Fact Sheet (Taken from High-Speed Rail: A National Perspective - High-Speed Rail Experience in the United States)
Apr-07	Corridor-Chicago Hub	Chicago Area Transportation Study	Chicago Area Rail System Transportation Facts (1976-2006)
Apr-08	Corridor-Chicago Hub	Surface Transportation Board - Section of Environmental Analysis	Purpose and Need for Canadian National Railway Company and Grand Trunk Corporation to acquire control of EJ&E West Company

Appendix 14 - RFEI 2009 - Reference List

Date	Topic	Author	Title
Sep-04	Corridor-Chicago Hub	Transportation Economics & Management Systems, Inc and HNTB	Midwest Regional Rail System Executive Report
-	Corridor-Chicago Hub	Federal Railroad Administration	Chicago Hub Network Fact Sheet
-	Corridor-Chicago Hub	Michigan Department of Transportation (MDOT)	MDOT-MWRRI Regional Rail System Brochure
Mar-09	Corridor-Chicago Hub	Midwest High-Speed Rail Association	2009 Annual Meeting Agenda
Mar-09	Corridor-Chicago Hub	SYSTRA Consulting	Midwest High-Speed Rail Golden Spike Seminar - Notes
Mar-09	Corridor-Chicago Hub	SYSTRA Consulting	Midwest High-Speed Rail Golden Spike Seminar and Midwest High-Speed Rail Annual Meeting - Notes
Jun-01	Corridor-Chicago Hub	Wisconsin Department of Transportation	Report for Return of Passenger Rail Service between Milwaukee and Madison, Wisconsin
Aug-04	Corridor-Chicago Hub	United States DOT, FRA, Wisconsin DOT, Amtrak	Milwaukee-Madison Passenger Rail Corridor Study- Finding of No Significant Impact (FONSI)
Apr-07	Corridor-Chicago Hub	Midwest Regional Rail Initiative (MWRRI)	Midwestern Legislative Conference Annual Meeting (2007)
Dec-05	Corridor-Chicago Hub	Midwest Regional Rail Initiative (MWRRI)	Status Report
-	Corridor-Chicago Hub	Midwest Regional Rail Initiative (MWRRI)	MWRRI Phase I EIS and Rail Corridor Transportation Plan
-	Corridor-Chicago Hub	Midwest Regional Rail Initiative (MWRRI)	MWRRI Fee Estimate of Phase I EIS and Rail Corridor Transportation Plan
2009	Chicago Bypass	NPR Article	Plan to Unsnarl Chicago Rail Hits Snags in Suburbs
2008	Chicago Bypass	CREATE Website	CREATE Project Overview and map
2005	Downtown Chicago	Illinois DOT, Chicago DOT	CREATE Feasibility Study
Jul-05	Downtown Chicago	Illinois DOT, Chicago DOT	CREATE Feasibility Study
2003	Downtown Chicago	Illinois DOT, Chicago DOT	CREATE projects
FY 2008	Illinois and Chicago	Amtrak	Illinois Fact Sheet
Varies	Chicago Area	Various	Track charts
Mar-09	Downtown Chicago	Illinois DOT, Chicago DOT	CREATE Partners Work to Improve Rail in Chicagoland Area

Appendix 14 - RFEI 2009 - Reference List

Date	Topic	Author	Title
-	Chicago-Milwaukee	Milwaukee Road (predecessor to Canadian National)	Track Charts - Milwaukee Road
Jun-09	Chicago-St Louis	TransSystems for MWRRI	Chicago-St Louis High Speed Rail Study
Nov-09	Chicago-Toledo	Indiana Dot, Ohio Rail Development Commission, National Passenger Rail Corporation	Northern Indiana - Northwest Ohio Passenger Rail Routing Study
Jan-03	Florida	SYSTRA/ SNCF International	Florida High Speed Rail Project Documentation provided to Global Rail Consortium January 2003
Dec-98	Florida	SYSTRA	Florida Overland Express / Operating Cost Analysis / Final Report
Jun-98	Florida	SYSTRA	Florida Overland Express / Tri-Rail Corridor / Optimization Of Typical Structures Volume 1/2
Jun-98	Florida	SYSTRA	Florida Overland Express / Railroad Bridge Training Program / Volume 2/2
Jun-98	Florida	SYSTRA	Florida Overland Express / Tri-Rail Corridor / Optimization Of Longitudinal Profile
Jun-98	Florida	SYSTRA	Florida Overland Express / Tri-Rail Corridor / Optimization Of Longitudinal Profile Report Final
Jan-98	Florida	SYSTRA	Florida Overland Express / Operations And Maintenance Support / Traffic Analysis And Operations Plan Definition

Appendix 14 - RFEI 2009 - Reference List

Date	Topic	Author	Title
Jul-98	Florida	SYSTRA	Florida Overland Express / Operations And Maintenance Support / Traffic Analysis And Operations Plan Definition / Optimization
Mar-98	Florida	SYSTRA	Florida Overland Express / Ridership And Revenue Study / Final Report
Apr-98	Florida	SYSTRA/KPMG PEAT MARWICK	Ridership Study. Florida High Speed Rail Project. Executive Summary Report.
May-98	Florida	SYSTRA	Florida Overland Express / Assistance A GEC Alsthom / Etude De Surete De Fonctionnement Du Systeme D'Alimentation
Aug-97	Florida	GEC (Geotechnical And Environmental Consultants)	Florida Overland Express / Florida High Speed Rail Project / Preliminary Phase / Geotechnical Review Of Alternative Alignments / First Draft /
Oct-97	Florida	SYSTRA	Florida Overland Express / Response To Fra Questions, Priority 3
Nov-97	Florida	SYSTRA	Florida Overland Express / Contract N° 97-E-010 / Engineering And Route Alignment Support, Task 2
Jul-97	Florida	SYSTRA	Florida Overland Express / Contract N° 97-E-010 / Technical Visit June 17 To 25, 1997
Jun-97	Florida	SYSTRA	Florida Overland Express / Contract N° 97-E-010 / Preliminary Phase - Engineering And Route Alignment Support Review 1
Oct-95	Florida	BOMBARDIER / GEC ALSTHOM / FLUOR DANIEL / ODEBRECHT CONTRACTORS OF FLORIDA	Florida High Speed Transportation System / Proposal Presented To: Florida Department Of Transportation - High Speed Transportation Program / Florida Overland Express / Volume 1

Appendix 14 - RFEI 2009 - Reference List

Date	Topic	Author	Title
Oct-95	Florida	BOMBARDIER / GEC ALSTHOM / FLUOR DANIEL / ODEBRECHT CONTRACTORS OF FLORIDA	Florida High Speed Transportation System / Proposal Presented To: Florida Department Of Transportation - High Speed Transportation Program / Florida Overland Express / Volume 2
Oct-95	Florida	BOMBARDIER / GEC ALSTHOM / FLUOR DANIEL / ODEBRECHT CONTRACTORS OF FLORIDA	Florida High Speed Transportation System / Proposal Presented To: Florida Department Of Transportation - High Speed Transportation Program / Florida Overland Express / Executive summary and video
Aug-95	Florida	SYSTRA	Florida Overland Express / Maintenance Of Rolling Stock / Catenary And Train Control System
Sep-93	Texas	SOFRRERAIL	Independent Ridership And Passenger Revenue Projections For The Texas TGV Corporation High Speed Rail System In Texas
Jan-91	Texas	Morrison Knudsen Corporation / Austin Industries / GEC Alstom / Bombardier Corporation / Rail Transportation Systems	Texas High-Speed Rail Authority / Texas TGV / Volume 1 / Franchise Application to Construct, Operate, Maintain and Finance a High-Speed Rail Facility
Jan-91	Texas	Morrison Knudsen Corporation / Austin Industries / GEC Alstom / Bombardier Corporation / Rail Transportation Systems	Texas High-Speed Rail Authority / Texas TGV / Volume 2 / Franchise Application to Construct, Operate, Maintain and Finance a High-Speed Rail Facility
Jan-91	Texas	Morrison Knudsen Corporation / Austin Industries / GEC Alstom / Bombardier Corporation / Rail Transportation Systems	Texas High-Speed Rail Authority / Texas TGV / Volume 3 / Franchise Application to Construct, Operate, Maintain and Finance a High-Speed Rail Facility

Appendix 14 - RFEI 2009 - Reference List

Date	Topic	Author	Title
Jan-91	Texas	Morrison Knudsen Corporation / Austin Industries / GEC Alsthom / Bombardier Corporation / Rail Transportation Systems	Texas High-Speed Rail Authority / Texas TGV / Volume 4 Appendix / Franchise Application to Construct, Operate, Maintain and Finance a High-Speed Rail Facility
May-07	Texas	Texas High Speed Rail & Transportation Corp.	Texas High Speed Rail & Transportation Corp. / Planning And Design Charrette / Phase 1

Reconciling mobility and urbanity

Challenges in modern station development



New mobility

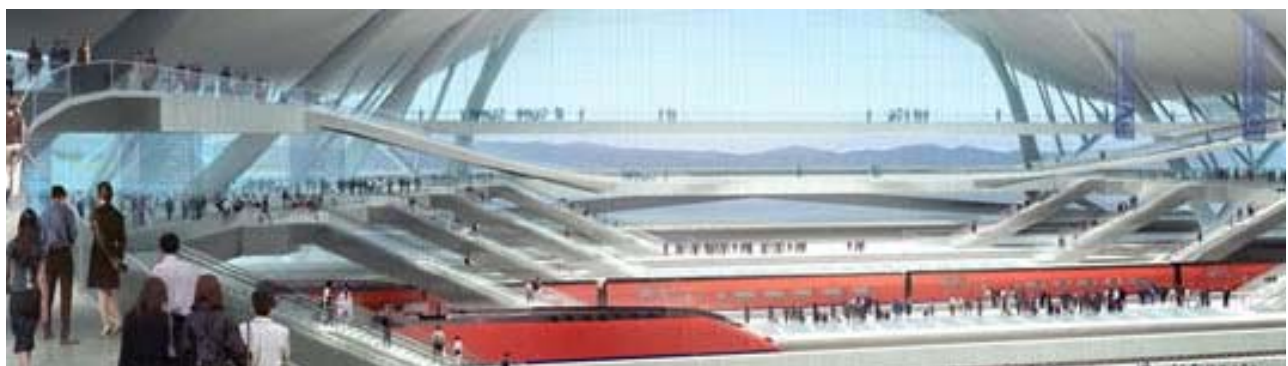
Modeled and shaped by movement, urban space has, for a century, been constantly transformed by the successive effects of the advent of motor vehicles thanks to the industrial revolution, the networks created by the different modes of transportation and, more recently, the emergence of mobile citizens reflecting a modern form of nomadic lifestyle.

Today, individuals are keen to experience mobility in a time continuum rather than through a succession of isolated moments separated by sequences of movement that are little more than tunnels or black holes. Movement now forms an integral part of their lives and they want to be able to take full advantage of the time spent traveling from one place to another. The evidence is all around us: people work on their computers on the train and are permanently connected to their offices, homes and families through the portable tools they carry with them.

Thus, modern urban and transportation design has to accompany people, and simplify their movement through the city. Given that virtual reality is of ever-greater importance in our day-to-day lives, the aim has to be to facilitate movement by providing sensations and encounters that belong to the real rather than the virtual world. Providing reference points, indicating the routes to be taken, introducing daylight right down into the depths of the earth, creating environments able to coexist with their natural settings, these and other elements have to form the basis of the conceptual design work conducted in regard to public spaces.



Ho-Chi-Minh City Malang Housing (Vietnam)



Wuhan station (China)

The dialectic of movement

There is an urgent need to reorganize the city inherited from the 20th century with its juxtaposed and layered transport networks which, over the years, have become increasingly segmented, fragmented and confused. This will be achieved by a dialectic approach between movement and non-movement, between speed and slowness, between the crowd and the individual. The ordinary citizen will be able to explore on foot the city celebrated by the great poets and thinkers of the 20th century. These pedestrians who are returning in force with their backpacks, cell phones and mobility accessories are today's multi-modal citizens.

Stations have, as a logical consequence, become hubs where pedestrians can change straight from one mode of transportation to another. However, pedestrians - and not only daydreaming children or senior citizens - are highly vulnerable in the city environment. A new distribution of public space - in particular, one where private car movements are restricted - has now become an essential element in the design and development of modern cities.

The new spatial definition now emerging is accompanied by the return of other forms of transportation, which had fallen into disuse over the last half century. Trams are again being developed or renovated in many places. In France alone, the number of tramway lines in operation, construction or planning rose from three in 1987 to 47 in 2009 ! The reason is easily understandable: trams are the transportation mode closest to the pedestrian, similar to a moving walkway. The city is reinventing slowness, providing a mode of transportation that is agreeable to use, efficient and healthy.



Paris St Denis station (France)



Montpellier station restructuring (France)



Angers St Laud station restructuring (France)

The multi-modal citizen

This trend towards a new form of journey comfort, although occasionally detrimental to speed, is not just specific to public and urban transportation but much more general. While the decommissioning of the ocean liner France took place in the same year as the launch of Concorde (1974), the demise of the supersonic plane also coincided with the inauguration of one of the world's largest cruise ships (2004). In just 30 years and at the end of a century of unbridled functionalism, concepts of comfort and enjoyment have returned. That the approaches to Strasbourg station should again have been decked out in green in time for the inauguration of the TGV East high-speed rail service, as they used to be at the end of the 19th century, is symptomatic of how the wheel of history turns.

Contemporary projects consist of reintroducing a sedentary quality of life into a world on the move. Car manufacturers and oil companies have understood the lesson, presenting cars as homes and providing a corner shop at the gas station. While suburban shopping malls try to hold on to their customers by offering them a new imagined reality, town centers are coming back to life by placing emphasis on a more laid-back lifestyle and soft modes of transportation. In the city, shops want nothing more than to be able to move out on to the street to display their products and establish direct contact with potential customers. Similarly, nature is moving back into the city and housing is taking over neglected areas. Touches of greenery are slowly springing up in inner-city settings.

All this has led to a new mix of types and functions, challenging the principles of functional separation and spatial specialization. People do their shopping in the streets and expressions like "I want to find everything I need along my way" or "My office is everywhere" explain the modern multi-modal citizen. The same applies to the home, with multi-purpose rooms, semi-open spaces and furniture on wheels. Society and lifestyles have changed from a mono-functional organization to one where no particular space has a specific use.



Paris Jean Jaures Avenue requalification (France)



Strasbourg station restructuring (France)

Towards new urban organizations

That said, the city of movement and the city in motion still remain to be physically defined. SNCF works towards letting people experience mobility in a way that will awaken their senses and allow them to fully enjoy the spaces they move through. Movement and the time taken to go from one place to another must become a pleasure. People need to be able to live mobility, to feel equally at ease whether they are moving or not; travel should be no more than an extension of their homes.

Therefore, the spaces structuring the city have to be reviewed and re-interpreted with the help of a new overall vision of mobility.



Nancy station area urban renewal (France)

It begins with railroad sites that formerly had a single use and are now developing a new range of different activities. Following half a century of considerable separation between transportation networks and spatial zoning, the time has now come to develop multi-activities and mixed uses. Activities such as working, shopping, relaxing and traveling merge and



minge and it is vitally important to organize and manage all these functions and their relations to one another with the aim to of simplifying the lives of the citizens concerned.

All this needs to be done in a way that does not create irreversible situations. Consequently, the city of movement is developed using spatial systems and organizations which are able to change and which can be reversed. It offers a new way of life for those using the city as a spatio-temporal continuum, structured by the visual reference points constituted by the city's most important places. In this vision of the city, transportation vectors point towards centers of activity and transportation interchange points, in the form of stations, are at the heart of urban life.



Le Mans station restructuring (France)

The resulting city will be different from the one that went before; new types of urban organization will develop. SNCF's aim is to continue to participate in the re-invention of the modern city and accompany new lifestyles by reconciling mobility and urbanity.

Modern station design

Station design today follows and combines approaches from various disciplines and is structured around at least three main topics, with the challenge of sustainable development as their common thread.

- The station and the city
- Intermodal layout, capacity development and passenger flow organization
- Station management, services, retail outlets and other activities

In major cities and conurbations, these themes are overlaid and completed by a general approach analyzing the coherence of a given station project with the whole urban multi-modal transportation network, in regard to general city transportation planning and city development goals. This includes detailed analysis of the current and future use of inner city railroad premises, technical facilities (maintenance, train storage etc) and other railroad-related infrastructure.



Aix-en-Provence TGV station (France)



Shanghai South station (China)



Avignon TGV station (France)

The station and the city

Stations have a major impact on their immediate environs, even on the organization of the city as a whole. Not only do they generate major pedestrian and vehicle flows, they also create all kinds of business opportunities and often attract substantial investment in offices, hotels, housing and in public facilities and services. The success of these operations depends largely on the quality of the functional links and urban integration of these different factors. Depending on the situation and the opportunities, station projects can be the chance to change land use regulations in station areas or to modify and adapt city master plans.

Thus, any major station transformation or development project has to look at land use and urban organization well beyond the actual station property, through active collaboration among the station and city planners and perhaps even with private investors. Ideally, it is the station planner who will take the lead in this approach, most often through specific contracts with the city.

Quite naturally, in such complex projects, SNCF tends to promote or support architectural and urban development solutions for the whole area, including office buildings, hotels and other private and public facilities.



Marseille St Charles station Euromediterranee urban project (France)



Seoul ICBT station and new city district (South Korea)



Bordeaux St Jean station restructuring and office development (France)

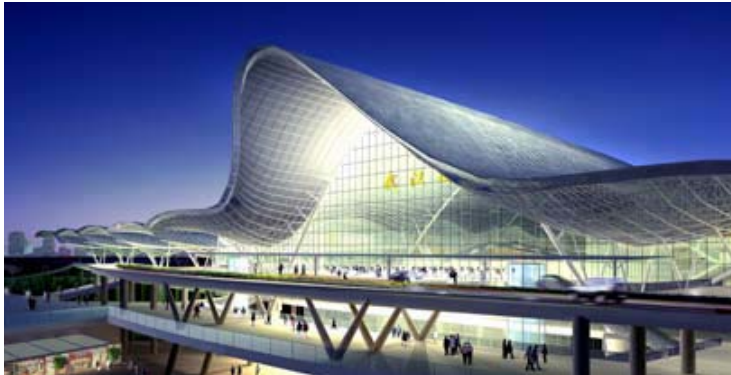


Paris Austerlitz station restructuring and office development (France)project (France)

The station and the city (2)

As stations have become magnets and even driving forces for urban development, their visual impact, the monumental or symbolic nature of their buildings, and their at times daring architectural design have grown in importance. Nowadays, mayors and politicians expect stations to be visual “business cards” and join the ranks of the outstanding buildings in their cities.

Particular challenges exist where classified historical station buildings have to be adapted to new needs.



Wuhan station (China)



Paris-Est station restructuring and commercial center (France)



Angers St Laud station restructuring (France)



Strasburg station restructuring (France)



Torino Porta Susa station (Italy)

Intermodality

All station projects need to focus first and foremost on the optimization of the station as an intermodal transportation hub between trains on the one hand and urban transportation modes such as subways, trams, buses, taxis, cars (rental and private), and bicycles on the other.

In fact, the station complex has to be seen as a pedestrian area linking all these modes in the fastest, safest and most convenient way. Here again, it is important to look beyond property limits and adopt a holistic design approach to the whole functional station perimeter.

It is at this stage of the design work where all issues relating to passenger flows (today and 20 years hence) have to be addressed, allowing for all modes and for future infrastructure plans, such as new local, regional or national (high speed) lines, subway extensions, future tram lines etc.

It is also here where future capacity must be considered, given the major changes currently occurring in our attitude to the role of the private car in society and the place of private cars in inner city areas. There is no doubt that, in future, car traffic in the city center will be much more restricted than today and its place will be taken over in part by various forms of public transportation. These will include car sharing and car hire solutions inspired by systems already in operation, for example the Ve'lîb bicycle sharing scheme in Paris.



Nantes station (France)



Le Mans station restructuring (France)



Orleans station and commercial center (France)



Le Mans station restructuring (France)

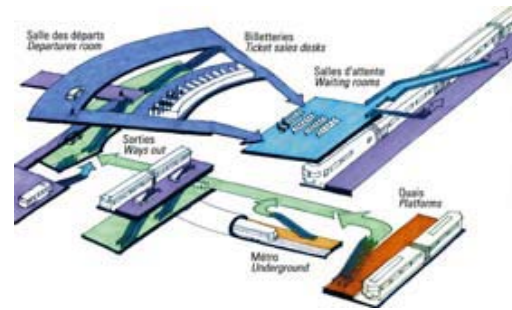
Intermodality (2)

Many cities are suffering from the continuous expansion of automobile traffic. Although perhaps unpopular today, it has to be admitted that there are numerous cases where no road infrastructure improvements would ever be able to cope with this increasingly intolerable situation. At a given moment, radical car traffic restriction measures will have to be implemented in inner city areas. It is important that city and local transportation planners should foresee this situation and allow for its consequences without delay in all major urban development work.

Therefore, SNCF has developed different design approaches for the ongoing restructuring of major French intermodal hubs aimed at boosting station capacity.



Paris North station restructuring (France)



Shanghai South station (China)



Lieusaint station (France)

Station layout

The organization and implementation of station services, and other commercial and non-commercial activities depend on various factors, which have to be established by the client and explained to the station designer.

1) Depending on the business model, present and foreseeable, of station ownership (transportation operator, city, private, mixed), station financing (state, city, transportation operator, private, mixed) and station management (transportation operator, private, mixed), one or several stakeholders may be involved, owning and/or financing and/or managing some or all parts of the station. As a result, the service boundaries and commercial zoning are not necessarily the same in all cases, as the different stakeholders may have different investment, management and cooperation constraints.

2) Depending on security, access and fare control policies, some or all parts of the station may need to have some kind of access restricted areas, either now or in the future. The existing or potential limits between these zones can strongly influence station design and service implementation (see the Eurostar Terminal in Paris-North station).

3) The time spent by passengers in the station before train departure has a substantial influence on the station's size and its facilities, especially waiting areas. Ongoing developments towards personalized real-time train information systems will in years to come enable passengers to be informed about real arrival and departure times at a distance, in advance. This will have a major impact on station area planning.



Shanghai South station (China)



Paris North station restructuring (France)

Station layout (2)

4) Similar trends can be observed in ticketing, with the growing use of automatic ticket vending machines, multi-operator tickets (the same ticket can be used on different transportation modes, train+subway for example) and widespread Internet-based ticket sales, including all sorts of electronic tickets. Again this will have a huge impact in the years to come on the space that has to be earmarked in stations for physical ticket sales, and also on staff back-office facilities. On the other hand, the arrival of larger numbers of automatic vending machines of all kinds will call for a new approach to spatial planning in order to achieve a consistent and understandable service offer.

5) Decentralized and personalized train schedule information in the station area will also create new passenger habits, with a tendency for passengers to move around more extensively during their time in the station. This factor is a further influence on the choice and layout of commercial services.

6) The levels of psychological and physical comfort of station clients (lighting and noise levels, heating, cooling, air quality, maximum accepted density (persons per square meter) in normal and downgraded situations, etc.) have to be fixed so they can guide the station designer, not only for the station building itself but also for the platform and other semi-protected areas.



Angers St Laud station restructuring (France)



Marseille St Charles station (France)



Paris-Est station restructuring and commercial center (France)



Paris BFM station (France)

Station layout (3)

7) On a more technical level, the phasing of the construction process can be a major design factor in station transformation projects, as in most cases building work will take place while maintaining normal station operations.

These different factors will not necessarily all exist right at the beginning of the project. Sometimes projects have to be phased over several years, with some new service policies or other developments only being implemented much later in time.

Therefore, flexibility and adaptability are needed on two levels:

- In project management methodology, during the design and building process, as often new elements have to be integrated into the project during these phases.
- In building design and layout, as the space will have to be adapted in the future to new or changed uses.



Paris North station Eurostar Terminal (France)



Mulhouse station renovation (France)



Paris Gare de Lyon station (France)

Station layout (4)

In addition, new construction standards are emerging for sustainable, energy-sufficient buildings (LEED, SB TOOLS etc). Here again, it is necessary to fix the correct reference values at the beginning of the design process.

Over the years, SNCF has developed a particular station design methodology and practices, and specific architectural design principles for sustainable structures, spaces, volumes and vertical flows that enable it to address these issues and to find workable and flexible solutions.



Paris-Est station restructuring and commercial center (France)



Katowice station restructuring and commercial center (Poland)



Cheng Du Ren-He commercial center (China)



Paris St Lazare station restructuring and commercial center (France)



Orleans station and commercial center (France)



Toulouse Green Center shopping mall (France)

The development of the railway infrastructure as a tool for long term urban master planning

Over and above these general points on station development it is worth mentioning that today's metropolitan city planning principles are also changing. In the face of new environmental challenges such as pollution control and limited energy resources and with the growing desire of citizens for more urban quality and better urban lifestyles, existing city master plans are being adapted and updated.

As an example, the current master plan of the Paris Ile-de-France region is currently under review in preparation for the creation of a "Greater Paris" (Grand Paris) city area. Ten teams were selected as part of an international competition, to make proposals for this development. SNCF's subsidiary AREP was one of the teams chosen for its particular concept of a new metropolitan development strategy based on public transportation networks.

In fact, SNCF believes strongly that the future high-density centers of the 21st century metropolis will be developed and structured around stations and transportation hubs at the intersections between railroads, subways, light rail and other public transportation modes. Proposed new transportation links would be designed to facilitate the creation of such hubs. In addition, some existing stations would have to be slightly moved in order better to feed these new centers.



Dijon TGV station (France)



Paris North - Paris East stations complex (France)



Paris Créteil-Echat station and urban development (France)



Bordeaux St Jean station restructuring and office development (France)

The development of the railway infrastructure as a tool for long term urban master planning (2)

Not surprisingly, many of these future sub-centers will be close to unused or under-used railroad land. The new urban development strategy will therefore incorporate the rail mode as a major partner, not only as a leading public transportation player but also by giving it the opportunity and role of reorganizing and optimizing its infrastructure and technical facilities, creating new real estate development possibilities and new income for the infrastructure owner.

The Greater Paris project is based on a combination of urban and public transportation planning to create the city of the future. In our opinion, any major HSR construction project must be consistent with ambitious general future city concepts, revolving particularly around the notion of developing new public transportation systems and related transit-oriented developments.



Beijing Dong Zhi Men station and office development (China)



Lille Europe station and city development (France)

All projects: AREP (SNCF groupe)

Except:

Ho-Chi-Minh City Malang Housing (Vietnam): AREP group

Wuhan station (China): AREP group and Institut n°4

Paris Paris Jean Jaures Avenue requalification (France): AREP group

Nancy station area urban renewal (France): AREP group

Shanghai South station (China): AREP group and ECADI Associés (East China Architectural Design and Research Institute)

Seoul ICBD station and new city district (South Korea): AREP group

Paris Austerlitz station restructuring and office development (France): AREP group,

Associated architect: Ateliers Jean Nouvel, Landscaping: Michel Desvigne

Strasbourg station garden: AREP group and landscaping: Michel Desvigne and Ingénieurs et Paysage

Torino Porta Susa station (Italy): AREP group and Silvio d'ASCIA, architect in association with A. Magnaghi, architecte Turinois

Le Mans station Square and Parking restructuring (France): AREP group and Philippe Duvergey, architect

Katowice station restructuring and commercial center (Poland): AREP group

Cheng Du Ren-He commercial center (China): AREP group and the South-West Architecture Institute

Orleans station and commercial center (France): AREP group

Toulouse Green Center shopping mall (France): AREP group

Beijing Dong Zhi Men station and office development (China): AREP group



A VISION FOR HST 220 TRAVEL IN CALIFORNIA /// JANE

Jane lives in San Francisco, where she has set up an architecture studio. She has been working for a few months on a new project for a recycling facility in Los Angeles, and she has to increase her presence there now that work is actually starting: she currently spends currently two days a week in LA.

She has included a small applet in her agenda that automatically proposes to book her trip, selecting the most appropriate schedules, every time she inputs a new meeting in LA (or anywhere on the network). As always, she selects the train that gets there just before the meeting so she has more time to spend home with her kids – she knows she can trust a carrier that scores a 98% punctuality rate. In just one click, the seat in business class is confirmed, according to the preferences she has set up in her traveler profile, and she is offered a home pick up, which she accepts. Her agenda is updated with all trip details, including pick up time, coach and seat number. These details are also uploaded on her trip management application, on her smart phone.

The following morning, the taxi gets to her place punctually at 8:20a. Twenty-five minutes later, she is walking through the terminal. Traffic was fluid and she has arrived 30 minutes ahead of schedule... Just too late to catch the previous train that is now leaving the station. She could wait in the frequent travelers lounge and relax, but she has a lot to do and wants to start working immediately. She heads directly to the train, already at the platform 35 minutes before departure.

She clears security and boarding controls in just one step. Her telephone has been automatically identified by radio frequency and all that she has to do is to show valid ID to the gate attendant. She could have gone through an automated gate, using her fingerprints, but she prefers the human touch. She asks the gate attendant whether the fog that is currently disturbing airline operations at SFO will affect her train – naturally. It won't, and she can board her train in absolute peace of mind.

A couple of minutes later, she is on board – she did not even need to look at the station and train map that was on her phone. A train attendant indicates her seat, and welcomes her on board with a fresh orange juice and some gourmet bites. Jane loves the concept of the on-board lounge, which allows her to start working – or relaxing – at her seat immediately after arriving at the terminal. And it is true that her seat compares easily with any airport lounge: of course, it is roomy and offers all necessary connectivity, but it is also elegant, and can slightly pivot towards the window for more privacy. A touch screen offers thousands of entertainment options, and a direct access to the service menu: Jane can choose between a power breakfast or a more gourmet option, and order drinks at a glance.

She hardly notices the arrival of fellow travelers and the departure of the train. The cabin, with only 12 seats, offers an unmatched level of privacy and quietness. She works uninterrupted till arrival in LA, where she sails through the station to be picked-up by her local associate.



A VISION FOR HST 220 TRAVEL IN CALIFORNIA /// ANG

Ang, a UCSD student, recently returned to his parents' home in Pittsburgh for the first in months. He had purchased a round-trip ticket from Air America. On his outbound trip, he flew from SD to Phoenix and took a connecting flight to Pittsburgh. His return flight now takes him all the way West to ONT, where he has a connection on a high-speed train down to SD. It is his first time on a high-speed train.

He checks-in online and gets two boarding passes, one for each segment. He drops off his massive backpack at the Air America luggage counter in Pittsburgh airport. He clears security in Pittsburgh and boards.

Unfortunately, his plane is delayed, due to winter storms in the North-East, and he makes it to Los Angeles two hours later than expected. A few minutes after this new arrival time was confirmed, he receives a confirmation on his phone that he had been re-assigned a seat on a later train service, with all the updated details. He knows he has only 45' for this connection, so he is reassured to learn that if he can't make it there is another service 30' later. Behind the scene, a seat has been protected on both services: that way, Ang is sure to wait the minimum time in the airport for this connection. The interconnection between Air America and the high-speed train systems ensures all necessary exchange of information, to make sure both Ang and his bag go smoothly and as quickly as possible through ONT.

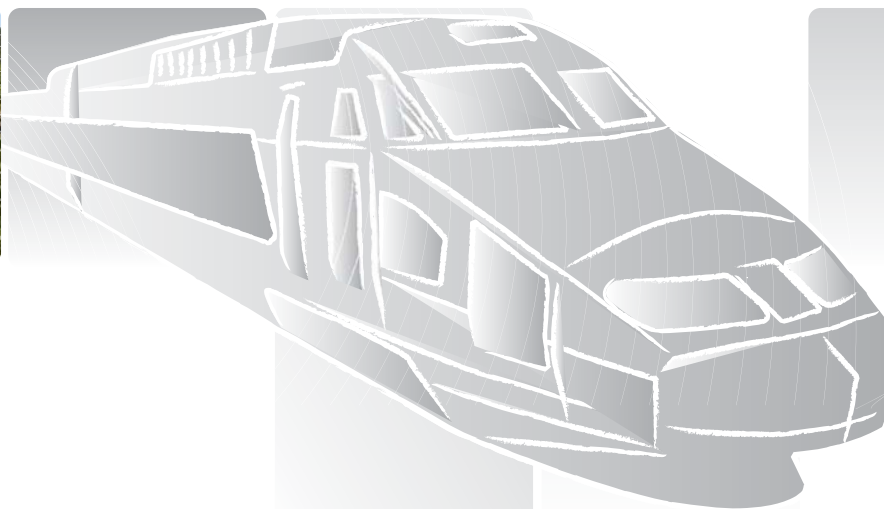
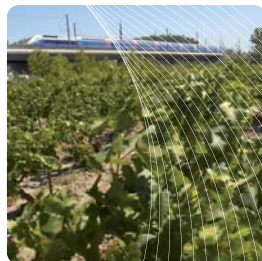
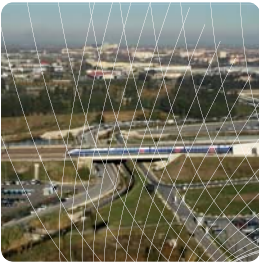
Ang walks quickly to the departure platform, and clears security scanning with his already-printed boarding pass. As a reminder, he gets a new printed document to know where to sit, with a train and seat map, so he can navigate quickly through the station.

He's now on-board, and the train smoothly leaves the station to accelerating 220mph. He hardly realizes how fast it is going. This ONT to SD Express Shuttle service offers only one class of service, with 4 seats abreast and plenty of legroom. Around him, most people are working on their computers, or having a quick nap. Some just wind down, gazing at a peaceful sunset on the Ocean. Ang plays with the large touch screen and decides to watch his favorite show on live TV.

After 20 minutes, an attendant comes to ask him whether he needs help for specific arrangements, like a reserved taxi ride. Behind the scene, the on-board staff has been informed of Ang's situation and strives to make the rest of his journey smooth and enjoyable. It might just be a small cost for the company, but it makes a big difference to Ang: when he gets to SD, he gets access to the priority lane for reserved taxis. As his luggage has also been delivered as a priority, it only takes him a few minutes to leave SD terminal and head on home.

HSL Environmental Design

SNCF references



HSL Environmental Design



SNCF has been designing, building, operating and maintaining High Speed rail lines (over 2,000 km to date) since the 1970's. Initially involved as Sponsor and Engineer, SNCF has evolved to become engineer- in-charge of civil engineering, structures and railroad infrastructure, provide the needed technical and environmental support to project sponsors or engineering services to manufacturers, depending on the project.

From the late 1970's onwards, following the introduction of required environmental impact studies, the assessment and determination of the negative impacts for the environment and the development of measures to mitigate these impacts have been given special attention by the SNCF teams. In Europe, environmental studies and required clearances are very similar to the requirements of the National Environmental Policy Act of 1969 (NEPA), which would govern the environmental clearance process for High Speed Rail.

Over the years, the protection of the environment has become one of the prime issues in the development of projects for new infrastructure in France. It is now taken into account from the conceptual design stage. It is one of the sensitive issues in the public debate and affects conceptual route selection at the preliminary study stage. The avoidance of environmental impacts is also the subject of a specific basic design file which is constantly interlinked with the technical one. The commitment of environmental best management practices (BMP's) is one of the keystones of the Declaration of Public Utility. It is an important step taken by the project sponsor in regard to gaining the support of interested stakeholders.

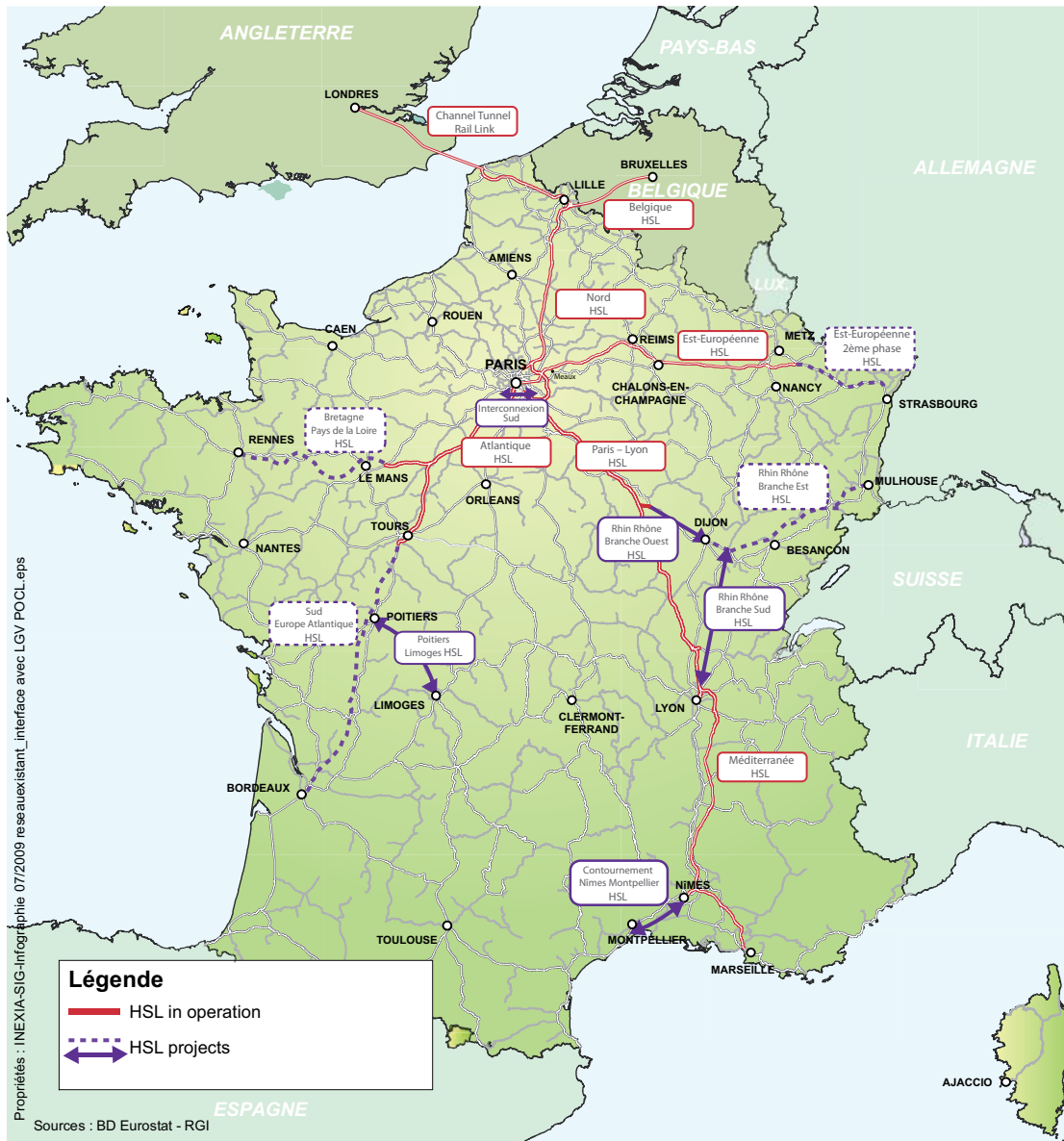
Throughout the project's life, implementation of BMP's and other mitigation measures are monitored with special attention to resolving environmental impacts through to their implementation. Typically on completed projects the efficiency of these measures is tested five years after service commissioning, allowing for adjustments that can be introduced for fine tuning.

SNCF's environmental experts are fully familiar with the typical main issues connected with mitigating environmental impacts of newly implemented High Speed rail lines:

- locating noise barriers;
- landscape integration through context-sensitive design;
- protection of ground and surface water resources and wetlands;
- preservation of the ecological corridors;
- vegetation design;
- design of remedial habitats (ponds, wetlands, riparian vegetation, reforestation, etc.).

SNCF's technical teams are thoroughly familiar with BMP's for all of these areas. As a result, the planning, civil engineering, structural and railroad infrastructure specialists integrate the environmental requirements as one of the main parameters early on in their design work. The resulting project is the outcome of a comprehensive process of integrated exchange between environmental specialists (general technicians, landscape designers, noise experts, fauna, flora and ecosystem specialists) and the technical disciplines.

HSL in operation



Our references in France:

"Paris-Lyon" HSL, "Nord" HSL, "Atlantique" HSL
"Contournement Lyon" loop HSL, "Méditerranée" HSL
"Ile-de-France Interconnection" HSL, "Est Européenne" HSL
Eastern and South sections of the "Rhin-Rhône" HSL,
"Sud-Europe Atlantique" HSL, "Bretagne Pays de la Loire" HSL,
"Contournement Nîmes-Montpellier" loop HSL

Our references abroad:

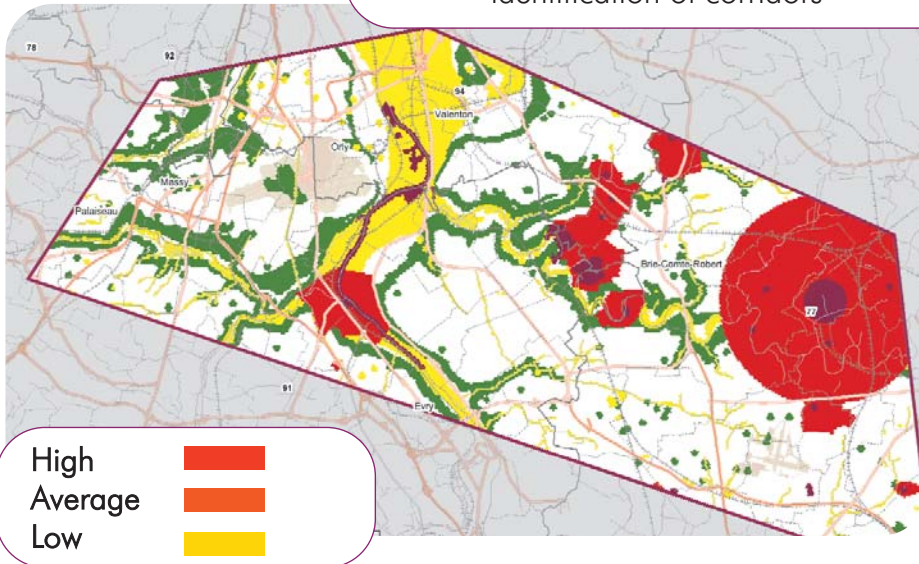
Channel Tunnel Rail Link, Belgium HSL
"Lyon-Turin Ferroviare" HSL project, Morocco HSL
Medina-Mekkah HS rail link

Environmental review prior to the public debate: designing the sustainable development project

Effectively the first studies in the life of a project, the functional preliminary studies are intended to define the purpose and need to be provided by the project. In this stage the guidelines for the sustainable development strategies are identified: general principles for service and integration, modal transfer, target savings in greenhouse gas (GHG) emissions, and the main environmentally sensitive issues.

The resulting decisions are then submitted to public debate in order to obtain the population's opinion.

Sensitivity of the physical environment via the identification of corridors



Definition of a sustainable development strategy

With infrastructure projects, sustainable development strategies aim to limit environmental impacts and ensure a positive contribution to transportation efficiency, social activity and economic development. To be successful these strategies must be triggered from the very inception of the project and then monitored and implemented throughout its life cycle: design, construction and operation. To this end, SNCF develops tools and methods to ensure:

- a project management guaranteeing the integration of sustainable development from the very first stages of design. For example, this can entail the definition and implementation of Environmental Management and Sustainable Development Systems based on locally-adopted strategies (towns, States).
- an assessment of the project's performance in regard to sustainable development, monitoring and decision making tools.

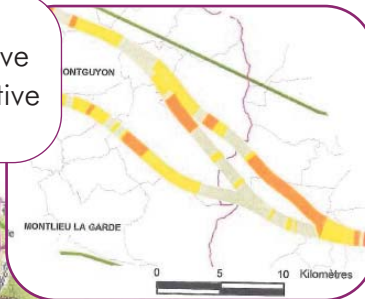
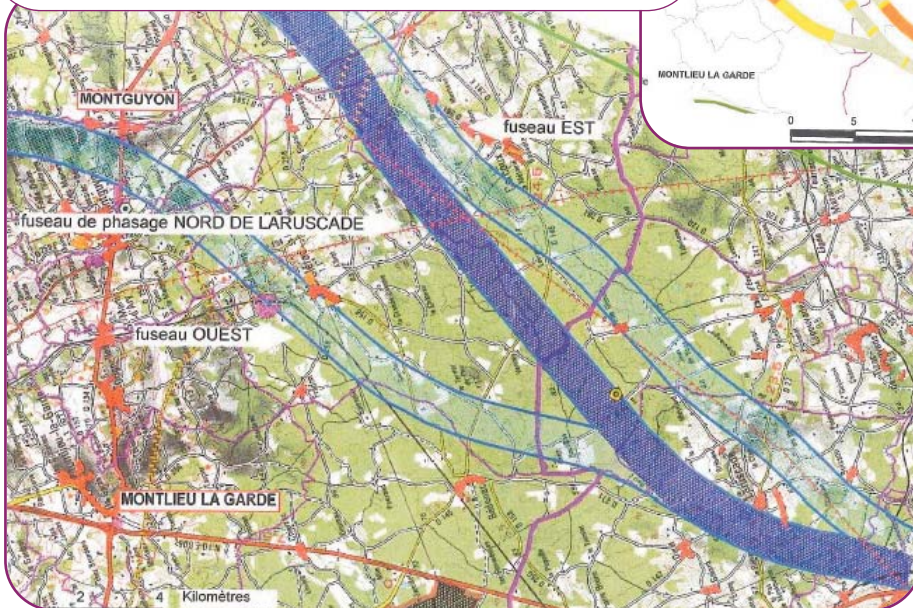
Appraisals to select the project with the lowest GHG emissions are also conducted at this stage:

- definition of the best location for stations (near urban areas, easy connections to public transportation) with a view to cutting down on car use,
- definition of conceptual routes designed to limit earth moving and other invasive construction at construction stage,
- comparison between the project and without the project for traffic impacts in terms of auto and air vehicle-miles saved and corresponding reductions in GHG emissions.

Alternatives Analysis: selection of a locally preferred conceptual route

The preliminary studies will involve an alternatives analysis (by both mode and route) with the aim of selecting the route with the fewest environmental impacts along with the best transportation and GHG reduction benefits. The Alternatives Analysis will assess the environmental sensitivities of the routes in order to identify the preferred alignment. This phase will also address how best to avoid solutions that would affect critical resources (natural or cultural heritage) or would expose the project to excessively high risks (natural or technological).

After reviewing the costs, benefits and impacts for all three alternatives, one alternative will be selected as the locally preferred alternative for further advancement.



Avoiding impacts by Pairing Transportation Infrastructure

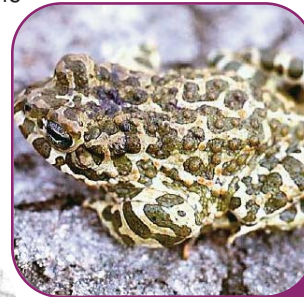
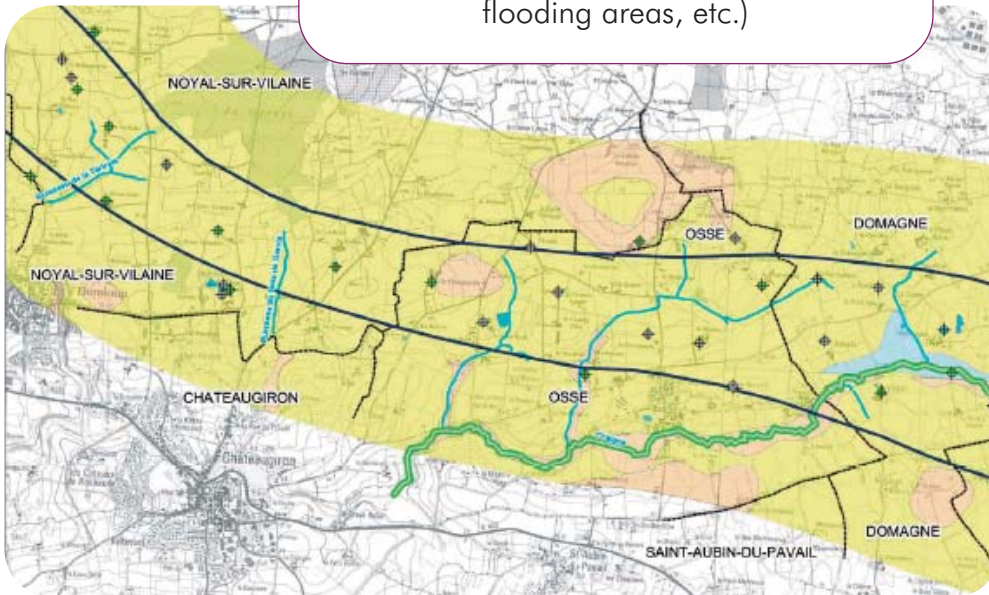
Whenever possible, SNCF routes are pair with another major transportation infrastructure element such as a highway or railroad. With this type of siting the project's environmental impact is reduced, as environmental habitat impacts are avoided and the project is integrated in an environment that is already affected by linear transportation infrastructure and is therefore better kept away from natural, agricultural, forestry or urban areas. Moreover, the remaining property between the two transportation systems could serve as an effective ecological corridor if needed.

Developing baseline environmental conditions and planning for their protection

Detailed environmental baseline conditions along the route under consideration will be documented. At this stage, the review will be precise and as exhaustive as needed to meet federal and state-level requirements for producing an inventory of the fauna, flora water resources and natural habitats, to characterise the hydraulic flows, landscape, urban, agricultural and forestry fabric, define the noise environment, air quality, the exchanges and transit operated within the study area.

This data helps quantify as precisely as needed to meet the requirements of reviewing agencies to measure the impact of the project on the surrounding environment and define the mitigation measures needed to make the project as transparent as possible to the environment...

Precise inventory of water related issues
(rivers, ground water tables, wells,
flooding areas, etc.)

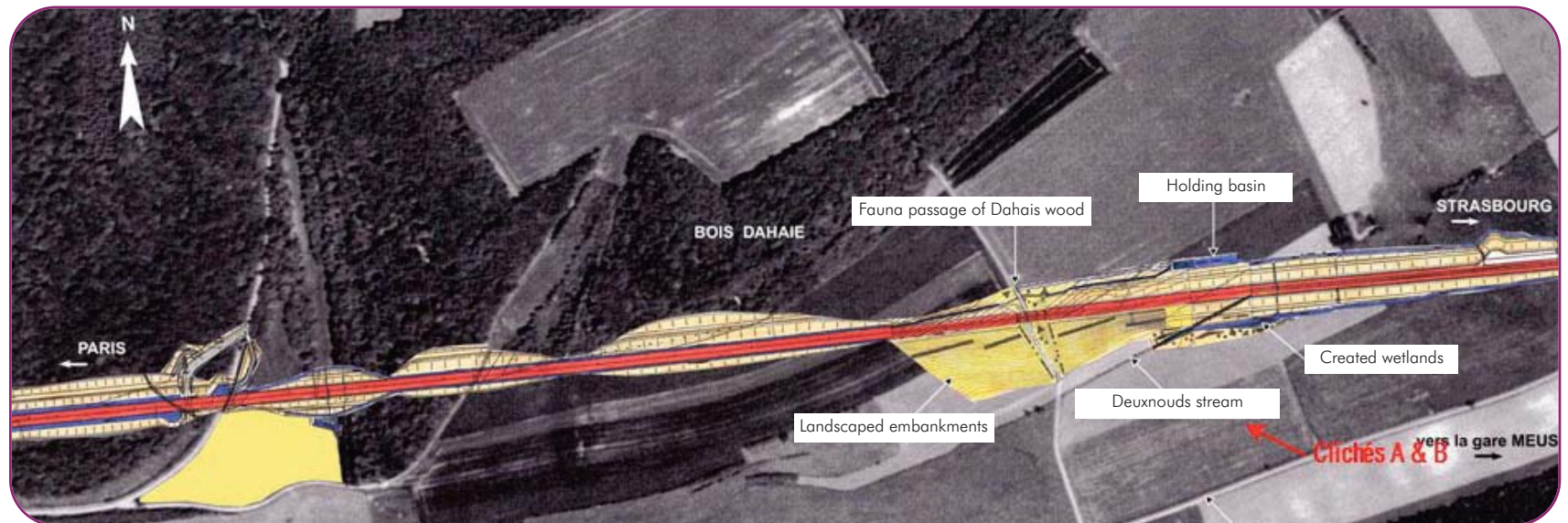


Fauna and Flora and other Environmental Resource Inventories

An indispensable parameter for the correct integration of the impacts on the natural habitats; the inventories are completed for all groups (fauna and flora) with particular emphasis placed on those most affected by linear infrastructures. By drawing from the expertise of natural scientists (ornithologists, entomologists, botanists, ecologists, etc.) and a committed associative network, the inventories are mapped and preventive or remedial measures are defined.



Basic design: characterising environmental resources and planning their protection



Before



After



The Landscape Master Plan

Proposals for landscape design in terms of shaping of civil infrastructure (cuts and fills, retaining walls, etc.) and final landscaping are developed from consultations between the environmental, engineering and landscape architecture disciplines, and with focus on mitigation of environmental issues, following an iterative pattern throughout design development and the environmental clearance process.

The project' design will identify more precisely:

- rights-of-way to be used for HSR and the transition of active HSR right-of-way to adjacent properties or other rights-of-way;
- visual impacts from housing and other sensitive land uses, important public places and vistas, etc.;
- interfaces between natural and engineered landscapes (planting of bank slopes, creation of fauna passages, creation of remedial ponds and wetlands, construction of noise berms, etc.).

Effective Public Outreach

Environmental impact studies and public outreach: making a commitment for the preservation of the environment.

By explaining to the public the purpose and need for the project and the design requirements for High Speed Rail, the environmental impact statement will describe the approach, the existing environment, the analyses of the impacts of the project on said environment as well as the positive impacts on a wider scale and to make commitments in regard to the design and accompanying measures, the research work that will, during the project life, to help reduce and mitigate, or even altogether remove, these impacts.

A public outreach process will be developed with project sponsors and in compliance with applicable state and federal requirements.

Analysis of the impact on forestry land (in green) for the qualification of remedial afforestation schemes.



Noise

Analyzing the parameters retained for the acoustic design of a new high speed line:

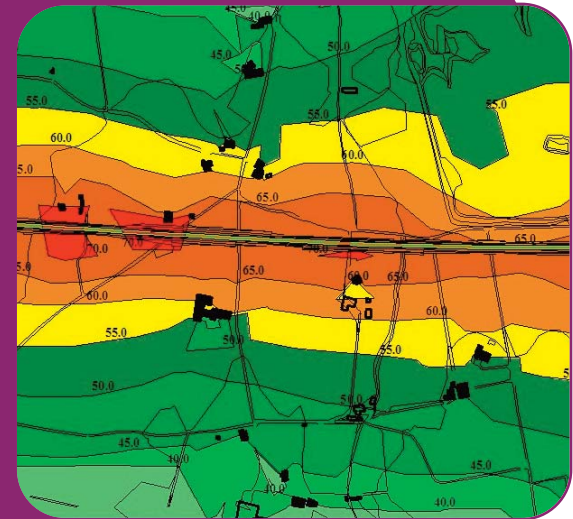
- definition of the indicators of embarrassment: equivalents sound levels, maximum sound levels, periods of observation...
- types of zones to be protected: residential zones, schools, hospitals,
- limit values of the indicators of embarrassment, by period, by types of zones,
- parameters of calculation of the noise source intensity according to the reserved indicators, types of trains and their acoustic characteristics, the speed and train quantity.
- parameters of calculation of the attenuation of the noise between the noise source and the sound receiving points: taken into account by three dimensions, by relief, obstacles, reflections, absorption by the ground, by the walls, effects of the meteorology, insertion loss of sound barriers...

Make the comparison of these parameters with those who are used for cases of similar studies in France.

Our analysis will also concern examination of the relevance of the noise barriers foreseen to the project:

- positioning of these noise barriers (location with regard to sites to be protected ;
- noise barriers design (length and height ;
- characteristics of noise barriers (not absorbent, absorbent, transparent...).

When it will be possible, our comments on the acoustic design will be accompanied with propositions aiming at to optimize efficiency of the noise barriers and to reduce costs of construction.



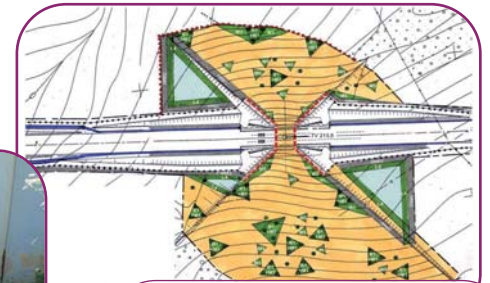
Detailed design and project: designing right to the last detail

In the detailed design development stage, environmental commitments take an undeniably technical dimension, with the aim of meeting all commitments in the most effective way:

- to design structures aimed to guarantee hydraulic transparency while ensuring the continuity of river banks and beds as well as the full function of wetlands and other water resources;
- to keep adjacent properties such as farms with equivalent functionality of the “before project” conditions;
- to facilitate wildlife transit and needed relationships between wildlife and plant populations;
- to protect the neighbouring residents against the nuisances generated by the infrastructure;
- to create a harmonious whole for the residents of neighboring communities and who will see it and live in its vicinity.

This will be achieved with all disciplines of the design and environmental teams involved together in developing designs to the last detail.

Drawing of an overpass for large fauna
(shaping and plantings by the landscape designer)



Drawing of an overpass for large fauna (shaping and plantings by the landscape designer)



Hydraulic structure, fauna passage.

Fauna passage design

The ecologist, the fauna specialists and the landscape designers are involved in this work for the recreation of the link between two areas separated by the infrastructure. Irrespective of their dimension, these structures must provide the animals with a means of crossing the rail track that is easily located and crossed with minimum stress, totally safe and as natural as possible. Moreover, they must be tailored so as to cater for the daily or seasonal transit of the widest range of species whether in day time or at night.

The design of these structures can only achieve optimum efficiency if it draws from an exhaustive study of the initial environment, experiment and feedback.

At the front, remedial wetland, behind, mixed passage (fauna and agriculture).



Awarding Construction Contracts; Preparing for the Construction Phase

As an indispensable interface with the construction phase, construction contract specifications will be prepared with utmost care for the ensuring that environmental protection objectives, preservation commitments, and environmental BMP's are maintained by all contractors. Contractor selection where needed will include prequalification for meeting experience criteria, as part of the sponsor's overall contracting strategy.

Watercourse restoration prior to revegetalisation



Construction of a noise berm

Meeting Environmental Impact Statement Requirements

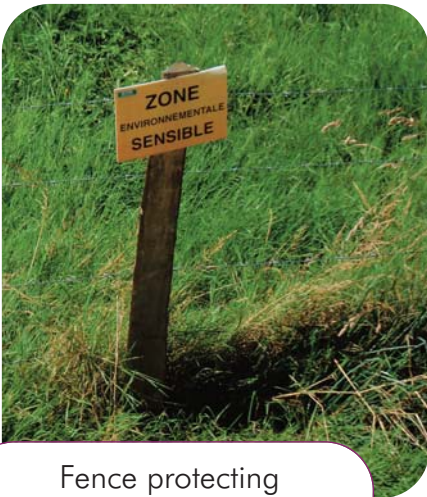
The conditions committed to in the EIS will be enforced in the construction specifications. The EIS itself will act as a reminder of the mandatory regulations applicable throughout the construction of the project.

The EIS will document all the studies completed: descriptions of environmental resources in the vicinity of the work sites, the protection measures in regard to construction activities (access restrictions or prohibitions, restrictions on certain customary practices – burning, pumping, discharge, etc.), This document provides a framework for the contractors' offers where the protection of the environment is concerned (resources, organisation, commitments). A contractor's commitment to meet the objectives defined by the Sponsor must imperatively be translated in its answer to the environmental impact statement.

Work site supervision: achieving a successful environmental integration

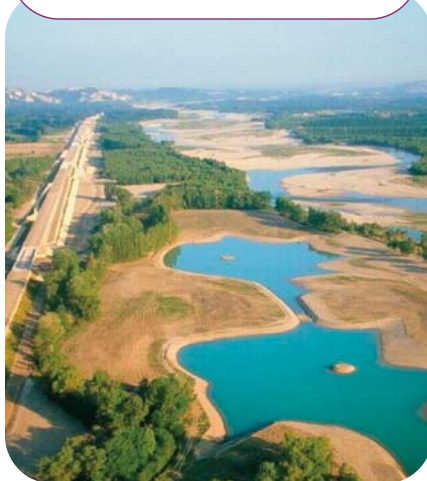
Construction is a crucial stage, as it is where the studies conducted beforehand are tested in the field. This phase concentrates most of the impacts on the physical, natural and human environment.

The work site is a place where interests that are potentially hard to reconcile meet and clash: daily routine, economic considerations, constrained time and budgets, technological showcases, intense activity, etc. on sites which are normally very quiet. All the conditions are present to result in environmental deterioration. The project organization together will constantly supervise, check, and tailor their behaviors on-site to meet the commitments they have made and the legitimate requirements of the State departments, local authorities, associations, and neighboring residents.

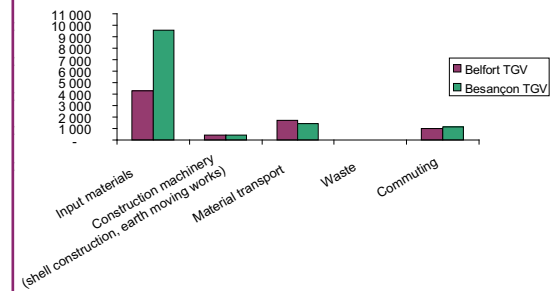


Fence protecting a sensitive area during construction.

Creation of a remedial wet land



Emissions generated by the construction of TGV stations
CO2 tonne equivalent



Carbon Imprint

SNCF produced the Carbon Imprint for the construction of two new TGV stations on the Eastern section of the French "Rhin-Rhône" HSL. The aim was to appraise and monitor GHG emissions generated by the station construction sites and 30 years' operation in order to:

- implement measures to limit emissions as construction progressed,
- provide feedback for future station construction sites.

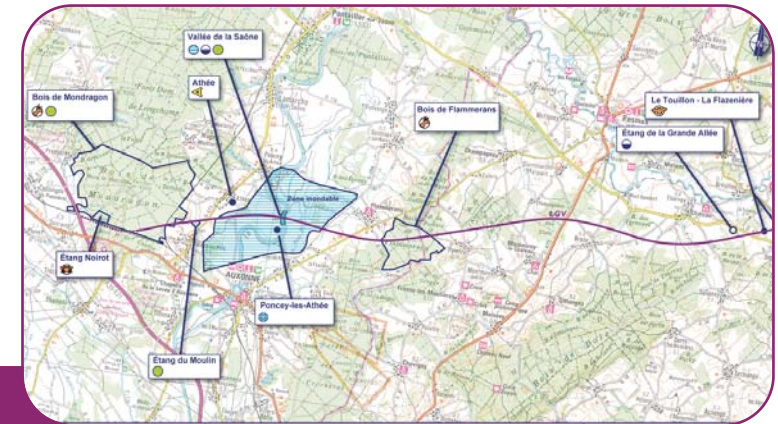
This approach is integrated in the overall Carbon Imprint for the Eastern section of the French "Rhin-Rhône" HSL (infrastructure and operation).

Environmental Balance: Confronting Facts to Forecasts and Learning Lessons for the Future

Environmental balance is intended to provide governing authorities and the public with an appraisal of the infrastructure's environmental performance by comparing the actualized impacts on the environment (after commissioning and start-up of service) with the Sponsor's forecasts and commitments as formalized in the project's design. This can be especially useful if the project is the first phase of a longer-term program.

The production of the balance involves missions for controlling the implementation of the environmental integration measures selected as a result of the initial studies, for monitoring over several years the efficiency of said measures, for analyzing the differences identified between forecasts and actualization and, finally, for making the know-how available for future projects.

These missions will require the involvement of experts in the various environmental fields: naturalists, acoustical engineers, landscape designers, hydrologists, etc. led by a general environmental project manager who organizes and manages the mission, compares the results, submits solutions to the Sponsor that identify the forecasted/actualized differences and assists it with the formalization and communication of the results of and lessons learned from the environmental statement.



Anticipating on the Environmental Balance, a Guarantee of its Relevance

In order to produce an outstanding environmental balance, it must be initiated from the very first study phases so as to characterise the condition of the environment before and after the project based on standard indicators that guarantee an effective comparison, and to ensure the traceability of the decisions made for the protection of the environment (objectives, anticipated results).

An innovative approach was implemented during the preparation of the balance for the Eastern section of the French 'Rhine - Rhône' HSL, which consisted, from the very first stages, in defining the scope of the balance, the monitoring method (selection of the indicators to be monitored throughout the project) jointly with a steering group made up of the Sponsor, representatives from the ministries of transport and the Environment, local elected representatives and associations

